AMERICAN MACHINIST

JULY 23, 1942

ARMAMENT SECTION: Shell Fuzes by the Million—Page 775

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AMERICAN MACHINIST

July 23, 1942

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MAJOR ARTICLES

V-Plan Saves Vital Metals.....*C. J. Wiberg and F. D. Kent* 761
Watch Your Control Equipment.....*E. H. Alexander* 764
Seamless Tube or Bar Stock?..... 767
Jig and Fixture Details.....*John G. Jergens* 768
Shop Shots From Aircraft Plants..... 770

ARMAMENT SECTION

Shell Fuzes by the Million..... 775

SHORT ARTICLES

Extinguishing Magnesium Fires..... 813
Tires Made to Stretch..... 71

IDEAS FROM PRACTICAL MEN

Gear Wheel Chuck Uses Pins.....*John H. Burkam* 772
Welding Jig Holds Metal Boxes.....*John E. Hyler* 772
Crank Moves Heavy Tailstock.....*George Holman* 773
Adjustable Screws Increase Belt Life.....*Max Khalos* 773
Profiling Fixture Clamps Small Part.....*Alex S. Arnott* 773
Shield Keeps Chips Out of Eyes.....*Frank C. Hudson* 774
Marking Machine Parts.....*Thomas Trail* 774
V-Blocks Center Engine Bearing.....*Fred Colvin* 774

NEWS OF THE INDUSTRY

Gaging Business 798b
Inside Detroit 798g
War Orders in Brief... 798h
Wartime Washington.. 798i
Names in the News... 798k
Obituaries 798l

DEPARTMENTS

What's in This Issue.. 69
Reference Book Sheet.. 795
Editorial 798a
Shop Equipment News.. 799
New Materials 810
Trade Publications..... 810

MORE 10 MEN TELL

what AMERICAN MACHINIST means to them, especially in war time, as a source of PRACTICAL PRODUCTION DATA . . .

1

"Completely reliable"

CHIEF ENGINEER, Tool Co.

"We have found it increasingly necessary to keep abreast of the times in the development of special tools for producing all types of war materials . . . *American Machinist* has been an invaluable aid in all phases of our work. We consider it a completely reliable source to which we can turn with confidence at all times."

2

"Armament articles valuable"

CHIEF ENGINEER, Cotton Machinery Co.

"Your Armament production articles have been of great value to our tool designers and have saved us days and even weeks of development work."

3

"Kept for reference"

SUPERINTENDENT, Pump Mfg. Co.

"We have always kept our *American Machinist* magazines for reference . . . there have been several copies recently, especially in defense work, where we have obtained valuable information which has helped us a great deal."

4

"Useful war information"

VICE PRESIDENT, Plumbing Equipment Manufacturer

"Articles on munitions manufacturing and general war products manufacturing in *American Machinist* have contributed valuable information for members of our mechanical division."

5

"Every issue valuable"

GENERAL MANAGER, Grinder Manufacturer

". . . many things of great value in every issue, especially during the last year or two. . . . We have been greatly helped in changing and improving our methods for handling greater volume. We do not feel that we could get along without *American Machinist*."

"We have found *American Machinist* of great help in its special features on tooling data for Armament, as well as the regular valuable information contained in its pages . . . we consider this magazine informative and up to date, and a necessity in our plant."

6

"Considered a necessity"

WORKS MANAGER, Electrical Equipment Manufacturer

"*American Machinist* has been very helpful to us in giving information on all types of manufacturing methods, and the advertisements have been considered of equal importance to the engineers, draftsmen, men in the factory and Purchasing Dept."

7

"Advertisements important"

EXECUTIVE, Instrument Manufacturer

"I have been a reader of *American Machinist* for at least 30 years . . . as you know, we often receive cards asking us to list the publications we read . . . I always list *American Machinist* at the head."

8

"Tops the list"

ENGINEER, Machine Tool Manufacturer

". . . have been able to save both time and materials as a result of the articles and suggestions in *American Machinist*. We, therefore, feel that it is serving a useful purpose in saving in these critical times."

9

"Serving in saving"

CHIEF ENGINEER, Radio Products Manufacturer

"Our key executives all read this magazine and receive a great deal of benefit in working out their daily production problems under normal conditions, but during our production emergency I don't know how we would be able to dispense with the service . . . "

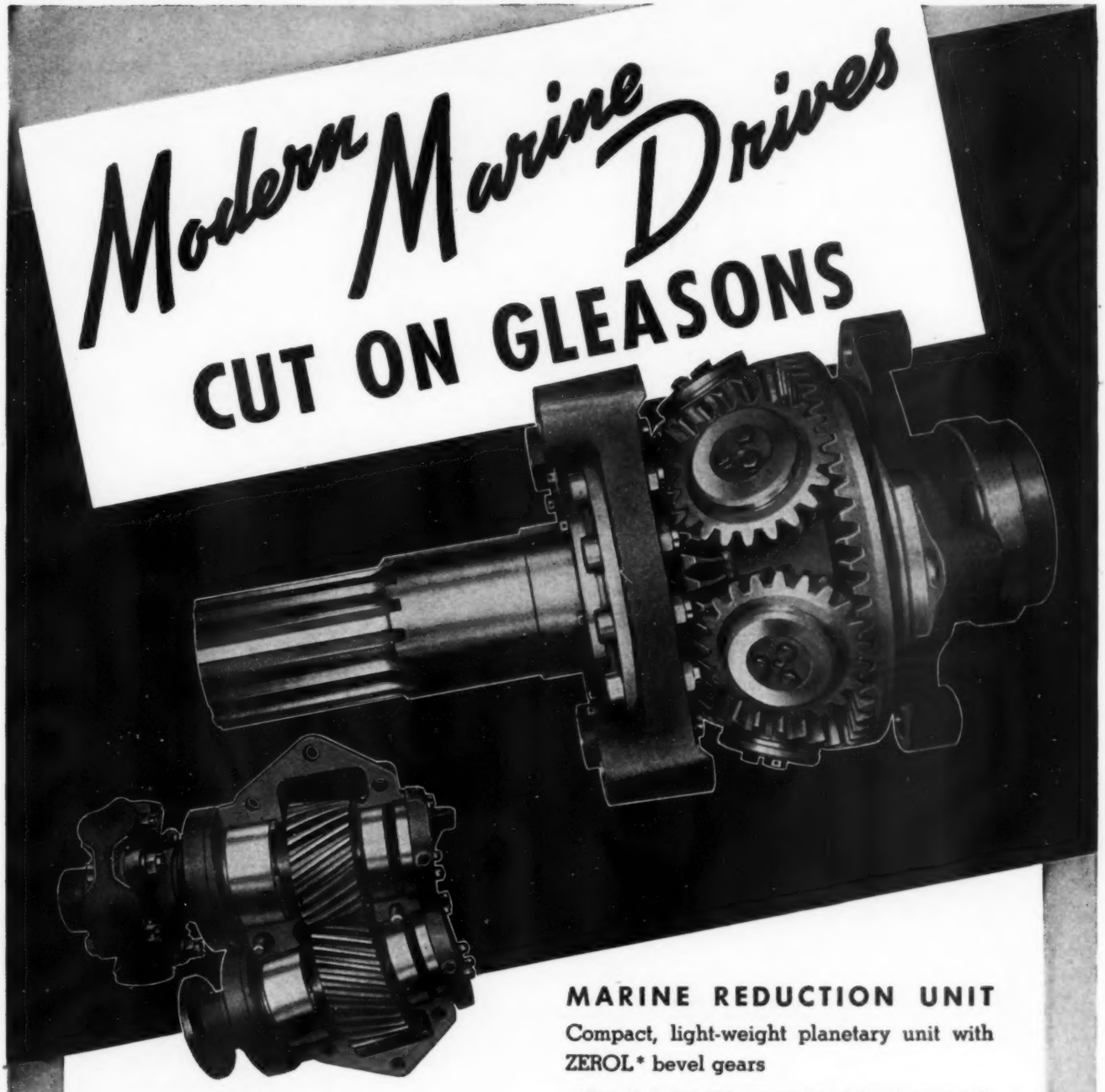
10

"Can't dispense with it"

PLANT MANAGER, Automobile Accessory Manufacturer

THE COMING ISSUES OF AMERICAN MACHINIST WILL CONTINUE TO SERVE THE PRODUCTION MEN OF METAL-WORKING-AT-WAR

Modern Marine Drives
CUT ON GLEASONS



V BOAT DRIVE

With angular spiral bevel gears, engine is mounted horizontally in stern for best weight distribution

MARINE REDUCTION UNIT

Compact, light-weight planetary unit with ZEROL* bevel gears

*Reg. U. S. Pat. Off.—curved-tooth bevel gears with zero spiral angle and same low thrust loads as straight bevel gears.

For engineering recommendations on bevel and hypoid gears, write Gleason Works

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

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IF IT'S . . .

Production

YOU WANT

BUY CINCINNATI NO. 0-8 PLAIN

WIN *with a Cincinnati!*

CINCINNATI

Illustrated at right is the CINCINNATI No. 0-8 Plain Automatic Milling Machine equipped with automatic Rise and Fall Spindle Carrier, ideal for milling parts for small arms, airplanes, range finders, photographic equipment, tanks, instruments, fuses and hundreds of other items.

AUTOMATIC MILLING MACHINES

Wherever *speed, accuracy* and *economy* are considerations in the milling of small parts, there you'll find CINCINNATI No. 0-8 Plain Automatic Milling Machines because they accomplish more in less time and at lower cost.

Numerous installations report substantial increases in output . . . some as much as 50%. To those of us who know these machines and their capabilities this is not unusual, for we have proved in our own shops that the No. 0-8 materially steps up the production of small parts . . . parts that must be turned out fast and milled to mighty close tolerances.

These milling machines are especially desirable where the operation does not permit the work to traverse directly into the cut, because the No. 0-8 equipped with automatic Rise and Fall Spindle Carrier takes obstruction jumps automatically. The entire operating cycle is a function of the machine and in no way dependent upon the skill of the operator. Handling the No. 0-8 is a routine job. The operator loads the fixture, flips the starting lever and the machine takes over — completes the cycle — returns and stops the table at the starting position, automatically.

If your place in the war effort calls for the milling of small parts and you are expected to increase production, you need CINCINNATI No. 0-8 Plain Automatic Milling Machines. Specification catalog M-964 covers details on all features and their benefits. Write for your copy today.

THE CINCINNATI MILLING MACHINE CO.

Cincinnati, Ohio U. S. A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES
SURFACE BROACHING MACHINES • CUTTER SHARPENING MACHINES

Ever hear t

A MAN'S hat blows off — and the history of the world is changed. This is that kind of story — a chain of circumstances that began with a gust of wind and ended by changing the shape of the world.

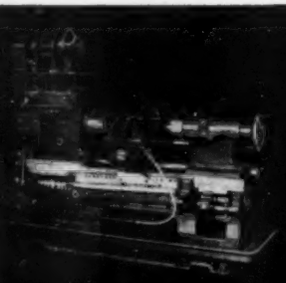
It was a wind that blew in 1815, wrecked a clipper ship, cast up a survivor named Isaac Tyson on the south coast of France . . . and fate decreed that he should land in the vicinity of a mine where chromate of iron was being dug. Thus is destiny made.

For Isaac Tyson remembered having seen such a mineral rock as that somewhere in the hills at home. Nursing a new-found interest in mining, he returned and launched upon a search that was to end one day in the mountains of Vermont. It ended when Isaac Tyson discovered iron ore deposits not far from the town of Windsor.

And it was that discovery — the result of a chain of circumstances which began with a storm off the coast of France — that made possible the growth of the great machine tool industry in Vermont!

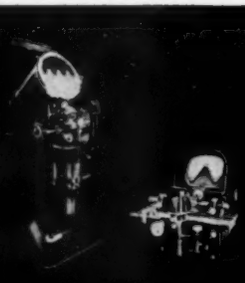
It was not long after Tyson's first iron mine was opened that the legend was born . . . the night they blew in a great new blast furnace that Isaac Tyson had built. In the starry darkness of the night there came a terrible groaning and wailing, and suddenly fire leaped out of the earth.

"Reckon it's the Devil," said the people in the hills. "Ike Tyson must of dug too deep!"



FAY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS

AUTOMATIC OPENING DIE HEADS

the legend of

TYSON'S FURNACE?

JONES & LAMSON, one of the foremost machine tool builders in the famous Windsor region, traces its knowledge of metals all the way back to Tyson's Furnace, more than a century ago.

Instruments and machines designed by this company are today in the front line of the greatest single war-producing industry on earth. And it is because of this achievement in designing precision machine tools through more than a century of the company's history, that Jones & Lamson engineers are so well qualified for consultation on your present and post-war problems.

Write today and ask for our illustrated catalogs.

JONES & LAMSON
MACHINE COMPANY

Manufacturers of **Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers**

Springfield, Vermont

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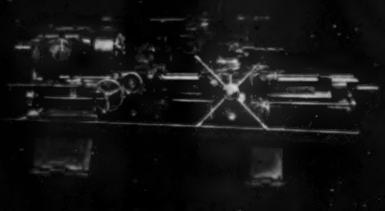


SADDLE TYPE
UNIVERSAL TURRET LATHE

PROFIT PRODUCING
MACHINE TOOLS

RAM TYPE
UNIVERSAL TURRET LATHE

Small Gears **OF ALL TOOTH F**

AT HIGH P

An outstanding advantage of the rack-type cutter used on the Fellows STRAIGHT-LINE GEAR GENERATOR is its adaptability to the cutting of a large variety of shapes and tooth forms. This feature makes this machine especially suited to the requirements of manufacturers of clocks, recording instruments, meters, dial indicators, cameras, range finders, gear-type fuses, etc.

Production rates, especially on thin blanks which can be ganged on an arbor and fed to the machine by an automatic magazine, greatly exceed that possible by subpress dies; and, with the additional advantage of smoother tooth surfaces and greater accuracy.

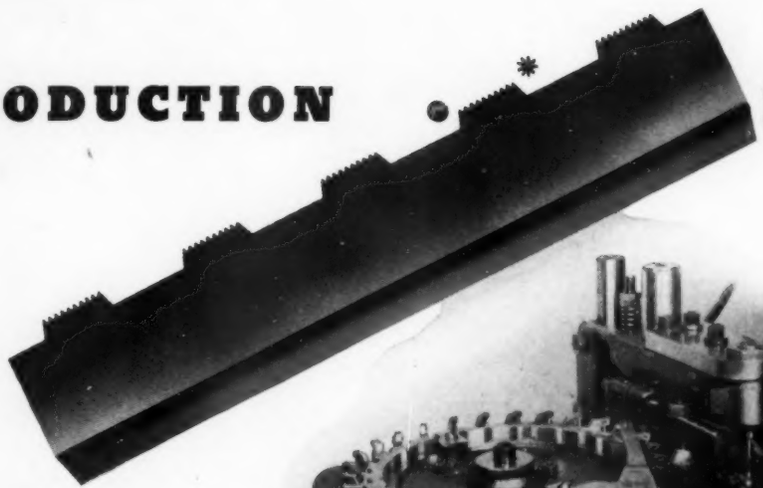
Every manufacturer of small fine-pitch gears should have a copy of our new bulletin, write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, Michigan, or 640 West Town Office Building, Chicago, Illinois.

FELLOWS

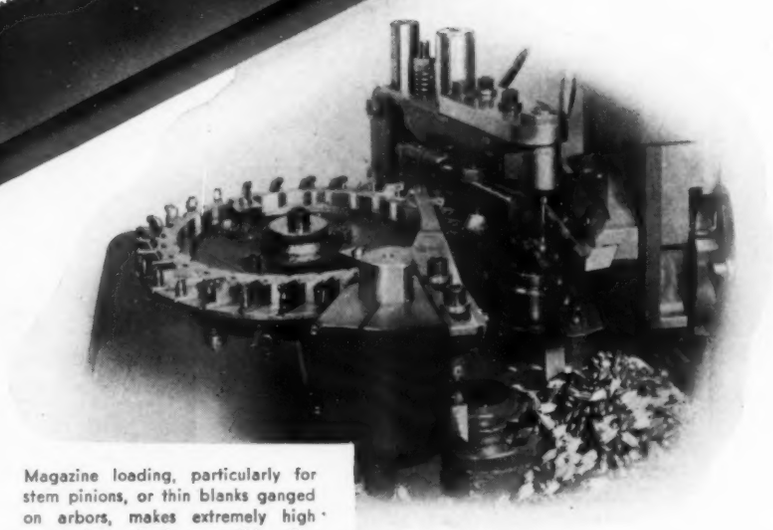
MACHINES AND TOOLS FOR GEAR PRODUCTION

TH FORMS

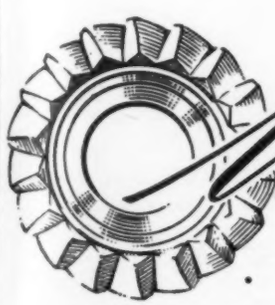
GH PRODUCTION RATES



The "Straight-Line" Cutter may be of gap-type, as illustrated, or have a continuous row of teeth, depending upon the size of the work.

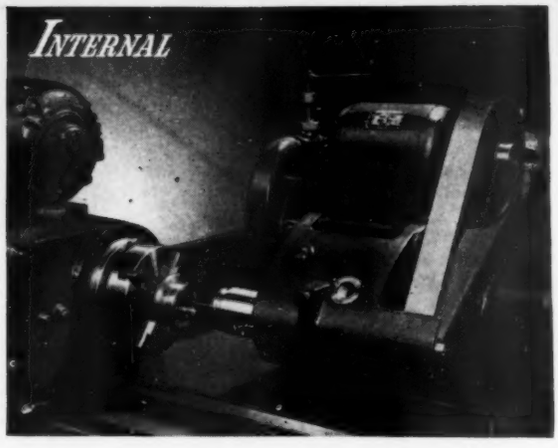


Magazine loading, particularly for stem pinions, or thin blanks ganged on arbors, makes extremely high speed production possible. The magazine is hand fed, but positioning, clamping and ejection of the work is automatic. The cutter reciprocates at speeds up to 1500 strokes per minute, depending on the material being cut.



Method

. . . . FROM BLANK TO FINISHED GEAR



CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings; between-center distances up to 72". Be sure to send for specification catalogs G-486 and G-474, which give complete details on all features and their benefits.

CINCINNATI GRINDERS INCORPORATED

Cincinnati, Ohio U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES

IF IT'S PRODUCTION YOU WANT

Buy- CINCINNATI HYDRAULIC UNIVERSAL GRINDING MACHINES

All over this country CINCINNATI Hydraulic Universals are helping win the battle of production. These fine precision grinders are not only capable of turning out twice as much work as older type machines, but they possess many refinements and unusual features that increase their usefulness.

One of these features is the Internal Grinding Attachment which makes it possible to grind internally and externally at the same chucking. Driven by an independent motor, this attachment is standard equipment on all Hydraulic Universals and is permanently affixed to the machine. Notice illustrations on the opposite page. When grinding externally the attachment is up out of the way and does not interfere with the operation. To grind internally simply pull the attachment down, fasten one hold-down bolt and it's ready. Even the belt stays on when not in use. What's more, you get absolute concentricity. And this is only one of many equally important features.

If you are interested in a grinding machine that will step-up production and give you continuous performance over long periods of time with practically no maintenance expense, buy CINCINNATI Hydraulic Universals. They are ideal for your toolroom grinding and general manufacturing work, and available in a size to meet your requirements.

Specification catalogs G-486 and G-474 illustrate and give complete details on all features and their benefits. Write for your copies today.

WIN *with a Cincinnati!*

CINCINNATI

VAN NORMAN

Milling Machines

VAN NORMAN

Directional Control of all Power Feeds, Simplifies Operation

OF VAN NORMAN MILLERS

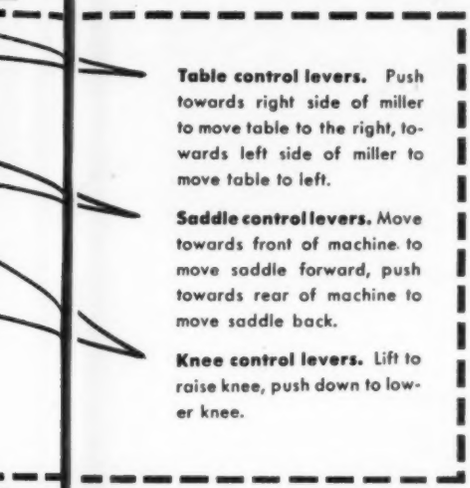


Table control levers. Push towards right side of miller to move table to the right, towards left side of miller to move table to left.
Saddle control levers. Move towards front of machine to move saddle forward, push towards rear of machine to move saddle back.
Knee control levers. Lift to raise knee, push down to lower knee.

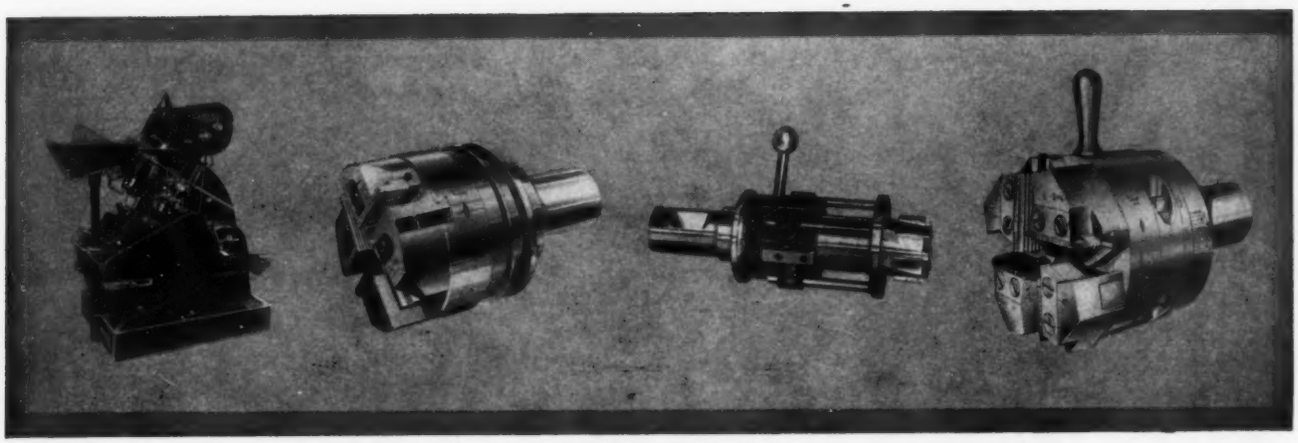
It is easy for the apprentice to learn and the skilled operator to remember that the table, knee and saddle of any Van Norman Miller travels in the same direction that the control levers are moved.

For example, if the operator is standing in front or rear of the machine and wishes to move the table to the right, he moves the table control lever to the *right*, if he wants to raise the knee, he *lifts* the control lever for the knee, if he wants to lower the knee, he pushes this same lever *down*.

From *either front or rear*, the operator has complete directional control of *all* power feeds,—simple, practical and time-saving. Add to this feature, the front and rear control of feed selection by a single lever, as well as front and rear control of 6-way power rapid traverse and you will see why operators prefer Van Norman Millers.

The "finish" of Van Norman Milling Machines is in accordance with the requirements of the War Production Board.

MACHINE TOOL CO., SPRINGFIELD, MASS.



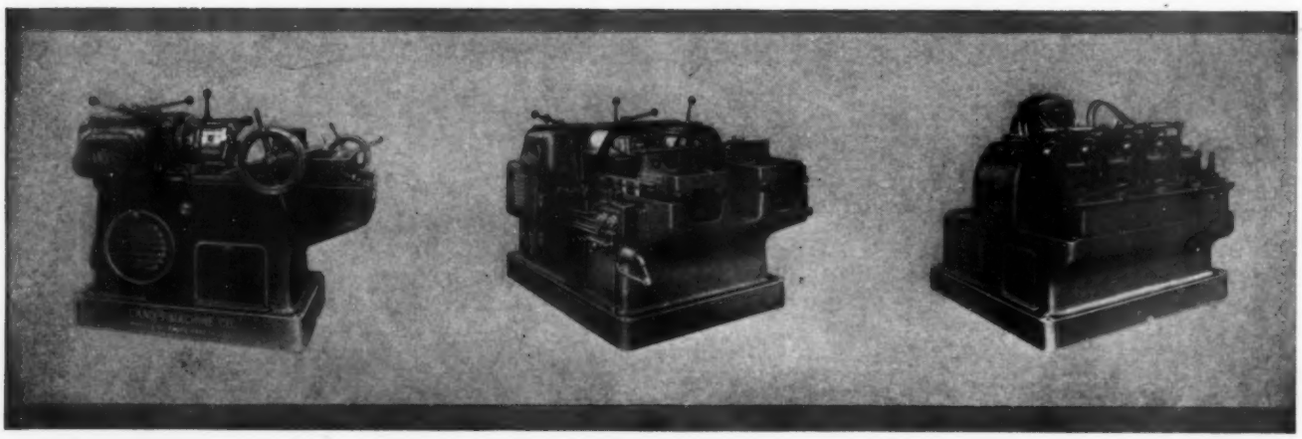
In Production for Defense

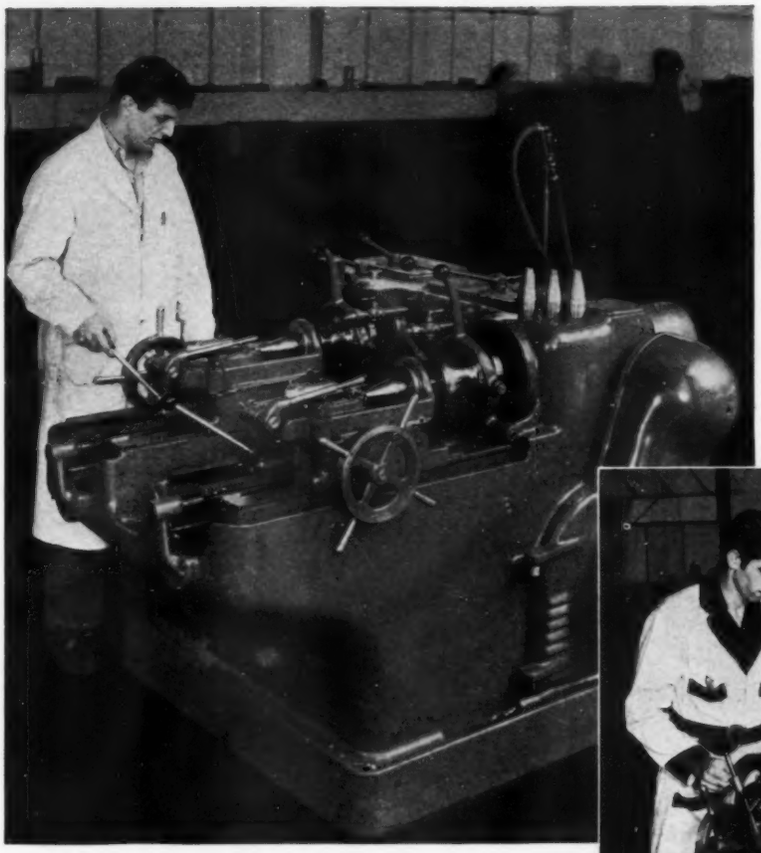
LANDMACO Threading Machines and LANDMACO HO Shell Tappers are doing their job in the National Emergency. One manufacturer of material employs LANDMACO Machines for threading Cartridge Containers and 81 m/m Mortar Shells. Production is highly satisfactory and the threaded components are well within the close tolerances required to assure unerring performance of the finished product.

> *Perhaps your thread cutting operations can be handled more efficiently and with a greater assurance of dependability with Threading Machines — made by LANDIS.*

Investigate the complete LANDIS Munitions Threading Machinery service and the post-war advantages of this equipment.

Be THREADWISE—LANDISIZE





BE THREADWISE

LANDISIZE

LANDIS
REG. U.S. TRADE—MARK PAT. OFF.

The* LANDIS *Line

STANDARD THREADING MACHINES
LANDMACO THREADING MACHINES
BOLT FACTORY THREADERS
AUTOMATIC FORMING AND THREADING MACHINES
PIPE THREADING AND CUTTING MACHINES
PIPE AND NIPPLE THREADING MACHINES
ROLLER PIPE CUTTERS
CHASER GRINDERS
ROTARY BOLT THREADING DIE HEADS
STATIONARY PIPE DIE HEADS
LANDMATIC HEADS FOR TURRET LATHES
LANDEX HEADS FOR AUTOMATIC SCREW MACHINES
LANCO HEADS FOR HAND-OPERATED THREADING MACHINES
LANDIS COLLAPSIBLE AND ADJUSTABLE TAPS

and the LANDIS PRECISION THREAD GRINDER

LANDIS MACHINE COMPANY, Waynesboro Pennsylvania

"AMERICAN" Radials Help Build Submarines

Where accuracy standards are rigid and production essential "AMERICAN" Hole Wizard Radials are meeting the challenge in a gratifying manner.

The two Hole Wizards shown here are hard at work on miscellaneous drilling jobs encountered in submarine production. Because these jobs do cover such a variety of drilling, boring and tapping "AMERICAN" Hole Wizards are particularly suited owing to their flexibility, their ease of control, their boring ability and high speed tapping facilities.

For all out production select "AMERICAN" Hole Wizards—hundreds of contractors are thankful they did.

"AMERICAN"
FOR
ALL-OUT
PRODUCTION

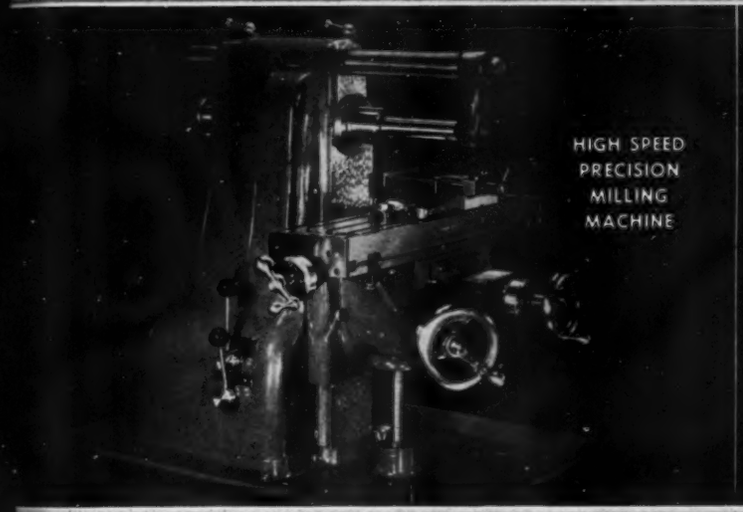
The American Tool Works Co., CINCINNATI, OHIO, U. S. A.

"AMERICAN" *Hole Wizard* RADIALS

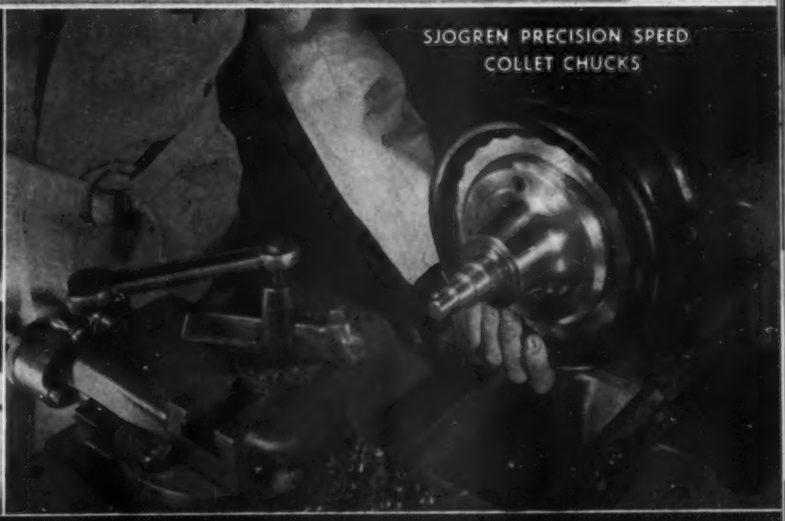
LATHES **RADIALS** **SHAPERS**

HARDINGE

PERFORMANCE HAS ESTABLISHED LEADERSHIP



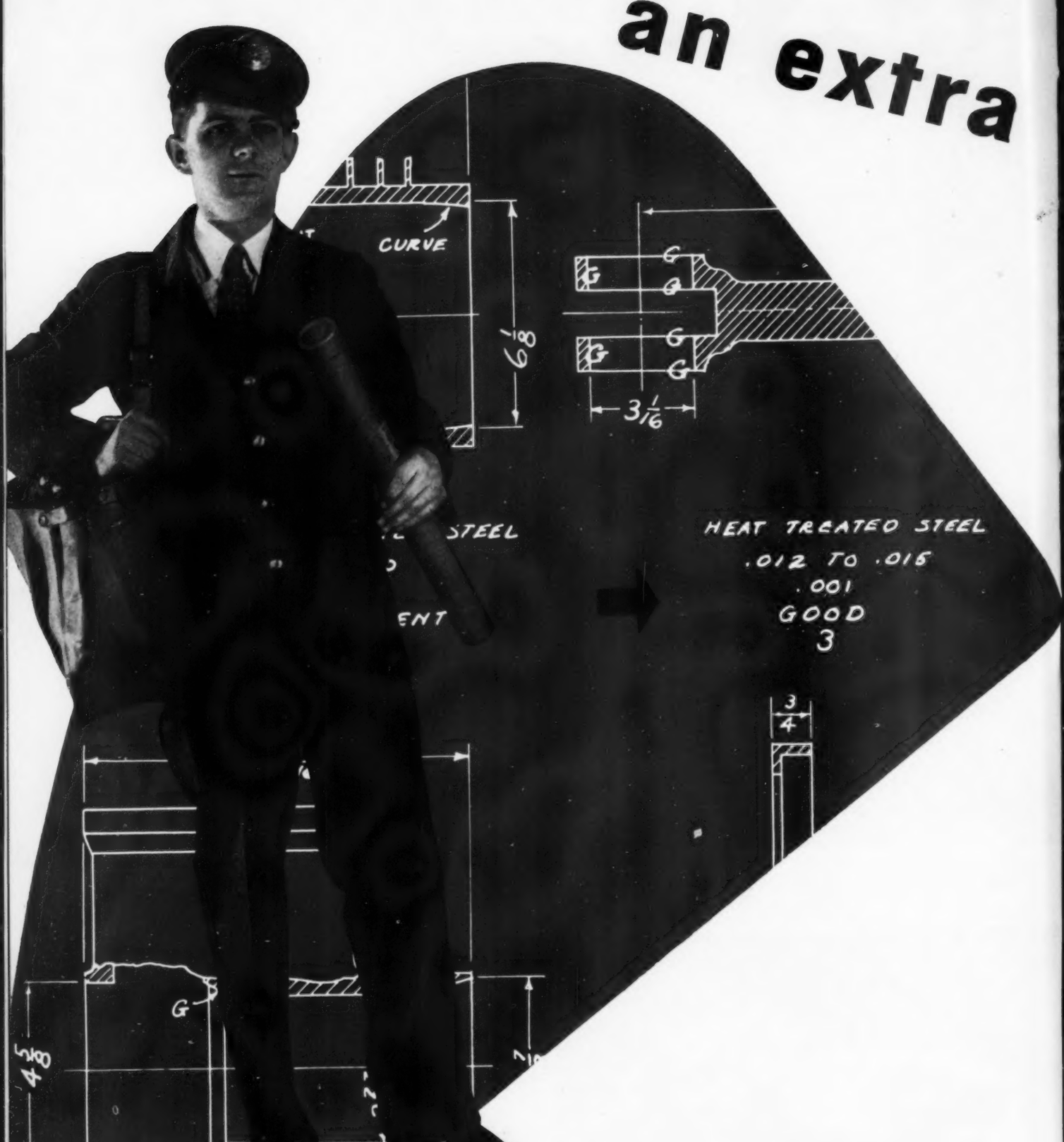
FOR HARDINGE PRECISION EQUIPMENT

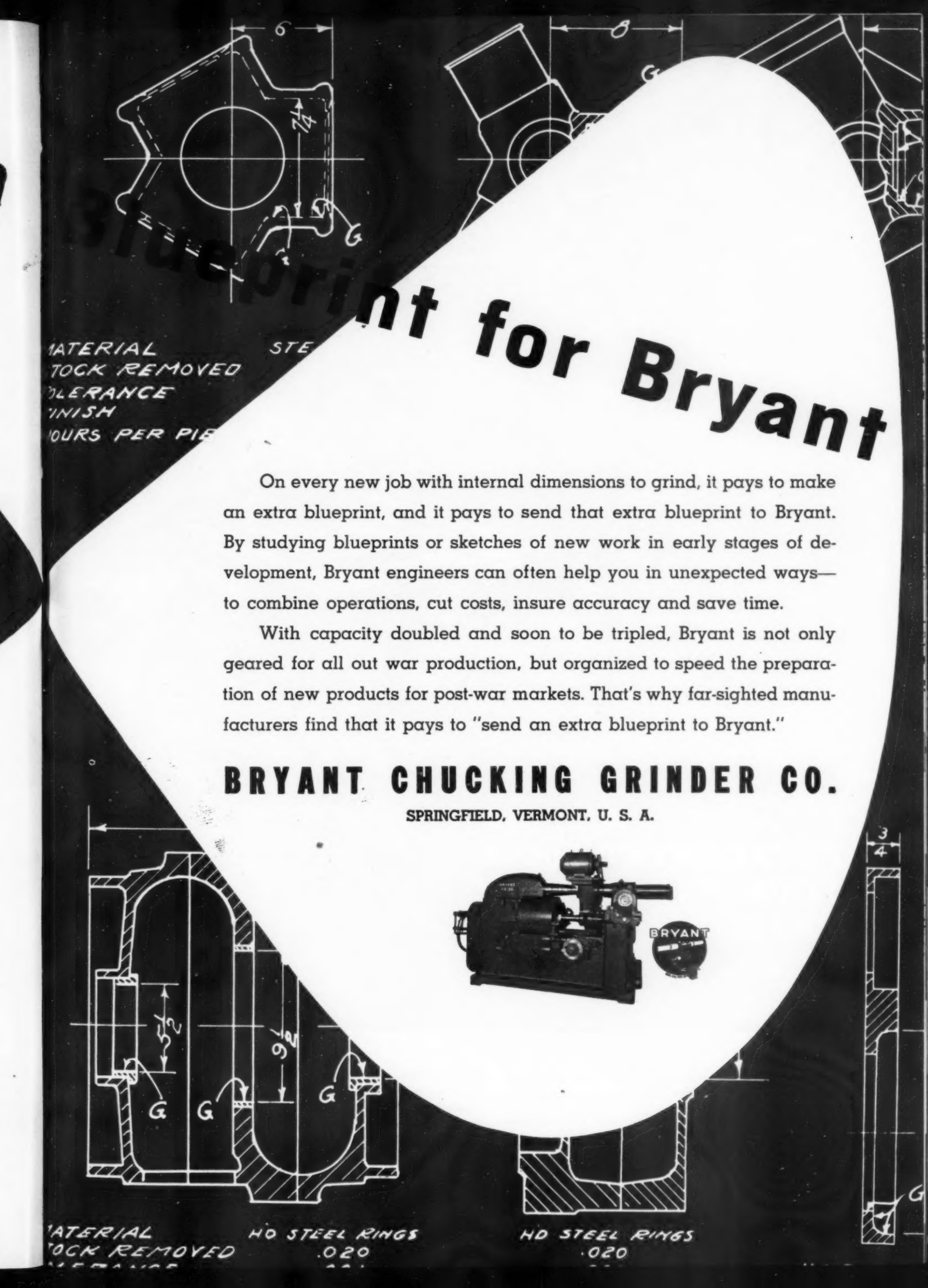


HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

an extra


CURVE
1 9/16
3 1/16
G
STEEL
ENT
HEAT TREATED STEEL
.012 TO .015
.001
GOOD
3
3/4
4 5/8
ATERIAL
OCK REMOVED
ERANCE
HEAT


Blueprint for Bryant
MATERIAL
STOCK REMOVED
TOLERANCE
FINISH
HOURS PER PIE
STE
On every new job with internal dimensions to grind, it pays to make an extra blueprint, and it pays to send that extra blueprint to Bryant. By studying blueprints or sketches of new work in early stages of development, Bryant engineers can often help you in unexpected ways—to combine operations, cut costs, insure accuracy and save time.
With capacity doubled and soon to be tripled, Bryant is not only geared for all out war production, but organized to speed the preparation of new products for post-war markets. That's why far-sighted manufacturers find that it pays to "send an extra blueprint to Bryant."
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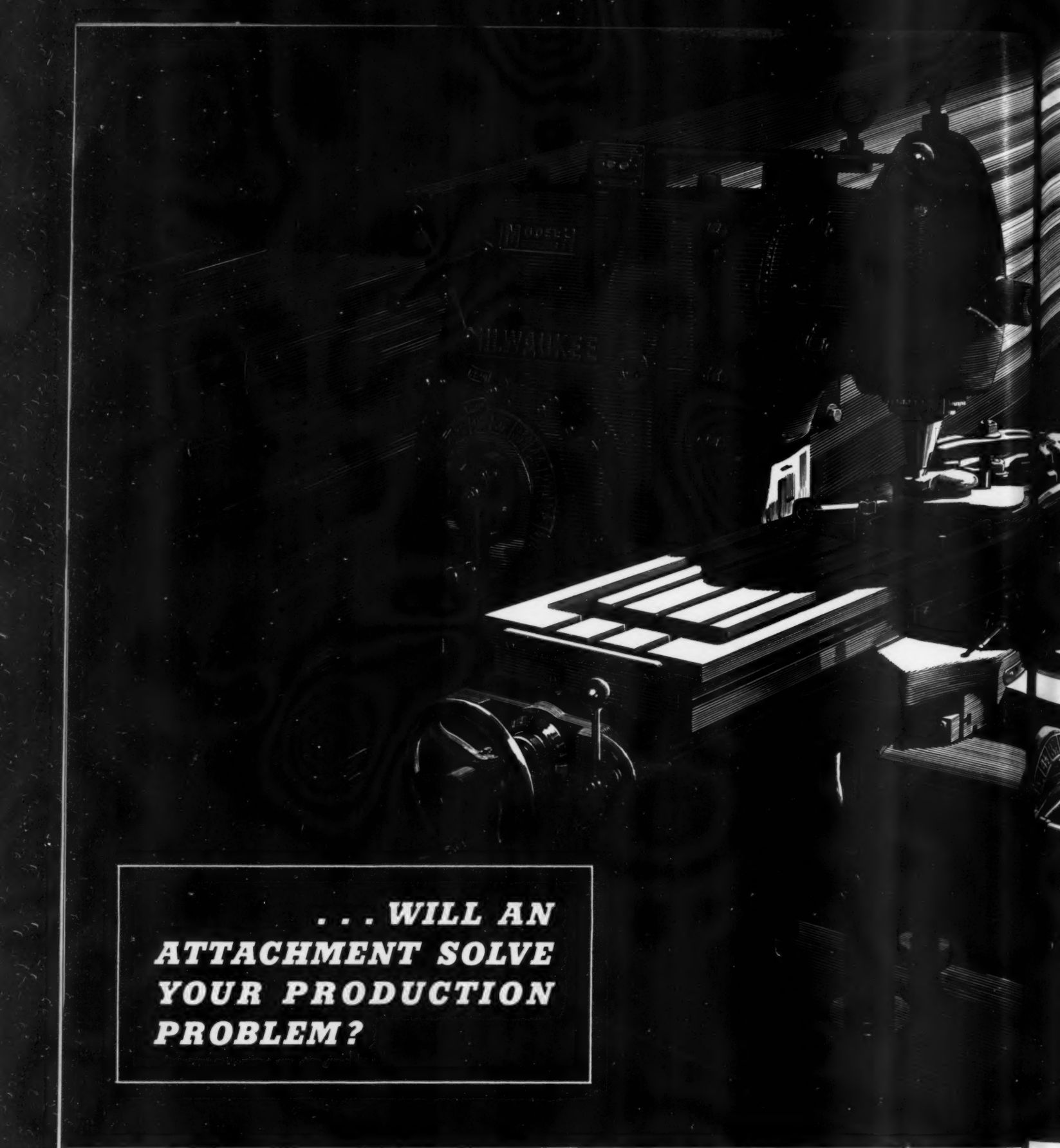
.020



. . . WILL AN ATTACHMENT SOLVE YOUR PRODUCTION PROBLEM?

Today's peak production demands that you get the most out of the Milwaukee Milling Machines in your plant.

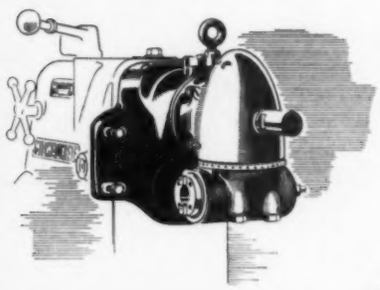
In many cases, standard attachments will increase the versatility and productive capacity of these machines, making the purchase of additional milling machines unnecessary.

The Milwaukee Heavy Duty Swivel Head Vertical Milling Attachment pictured above quickly adapts the horizontal milling machine to vertical milling. The cost of the attachment is less than one-tenth that of a Vertical Milling Machine, and it can be rigidly mounted on the machine in less than ten minutes. Its spindle speed is the same as the milling machine spindle.

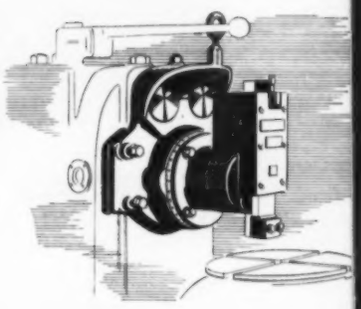
Milwaukee MACHINE

Other Attachments and Accessories Tha Multiply the Range and Productive Capac ity of Your Milwaukee Milling Machine

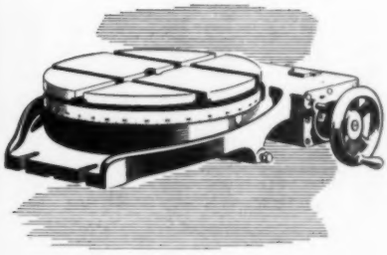
Because of the critical shortage of good milling machines, w suggest that you carefully investigate the possibility of usin standard attachments. Shown below are several typica Milwaukee attachments and accessories which will increas the versatility and productivity of the Milwaukee Millin Machines in your plant.



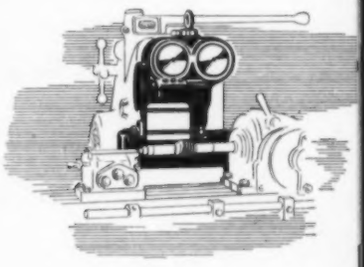
Standard Universal Milling A tachment **— quickly converts horizontal milling machine fo vertical operations—also permit milling of single and compoun angles on dies, jigs, fixtures. Ca be swivelled 360° in two plane Information in Bulletin No. 65**



Slotting Attachment. **Many slotting operations can be performed by using this attachment in connection with the dividing head or rotary table. In many cases, it makes the purchase of a Slotting Machine unnecessary. Bulletin No. 656B.**



Indexing Type Rotary Table **— for speed and accuracy in circula milling and drilling. Also per mits indexing for varied borin operations. Available in severa sizes, either hand feed or powe types. Write for Bulletin No. 652F**



Thread Milling Attachment **— Converts any model H, KM or K Milwaukee Universal Milling Machine (equipped with Low Lead Attachment) into a practical and efficient Thread Miller. Particularly advantageous where a standard Thread Milling Machine is not available. Bulletin No. 653D.**

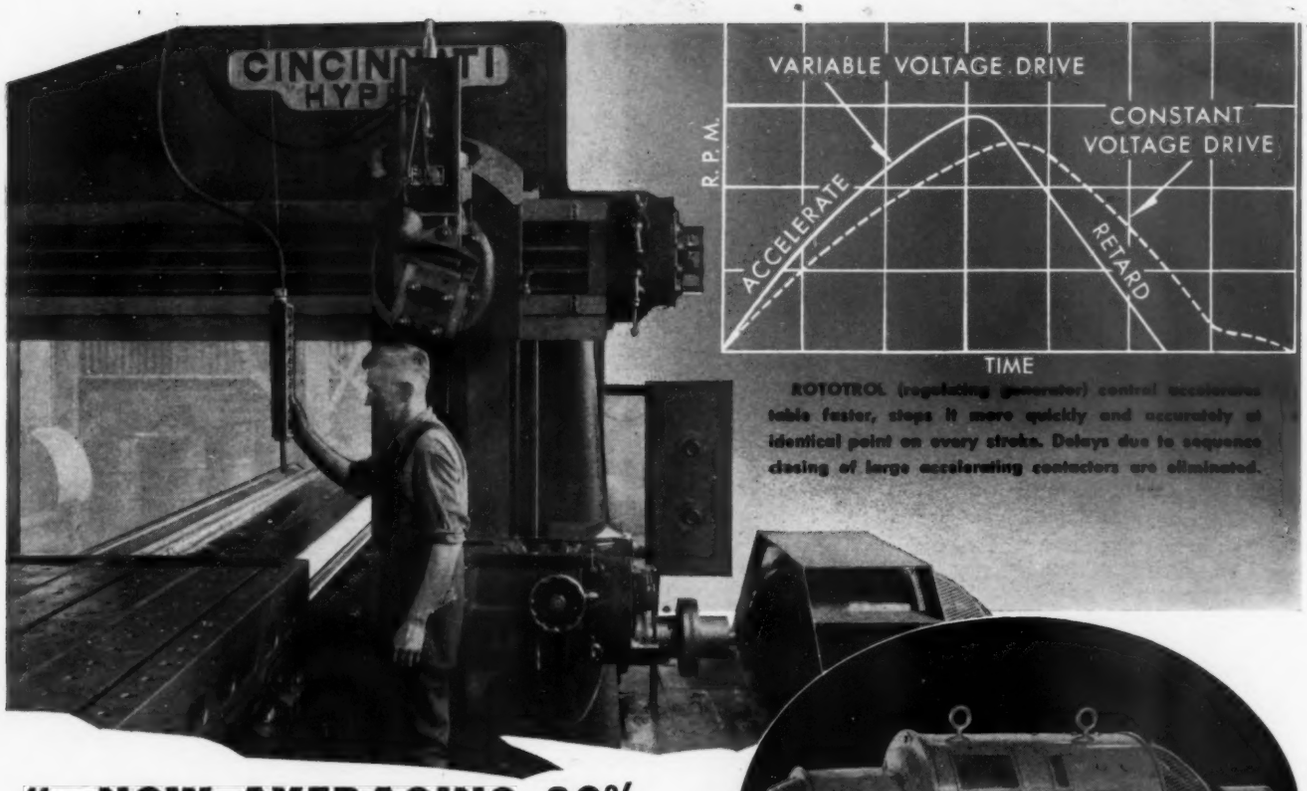
With priority regulations restricting the delivery of new Milling Machines, we believe the best way to be of immediate service to our customers is to suggest ways and means of getting the most out of their present Milwaukee Milling Machines. Kearney & Trecker representatives are schooled in all phases of milling and are placed in your area to help you. Feel free to make use of their knowledge and experience. Write for the name and address of the representative nearest you.

Write for complete information on this and other Milwaukee attachments and accessories — standard and special — to increase the range of usefulness of your present Milwaukee equipment.

KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U.S.A.

KEARNEY & TRECKER
CORPORATION

E T O O L S



ROTOTROL (regulating generator) control accelerates table faster, stops it more quickly and accurately at identical point on every stroke. Delays due to sequence closing of large accelerating contactors are eliminated.

"...NOW AVERAGING 30% (OR MORE)

HIGHER

PLANER PRODUCTION"

Four-in-one rotating unit of Variable Voltage Drive combines induction motor, variable voltage generator, exciter generator and ROTOTROL all on the same shaft. Separate cabinet houses simplified control panel.

...thanks to ROTOTROL...new Westinghouse control

Cuts faster—returns faster! ROTOTROL—the heart of the Westinghouse Variable Voltage Planer Drive—speeds up return strokes, gives more cutting strokes per minute—with accuracy and flexibility not obtainable by any conventional control!

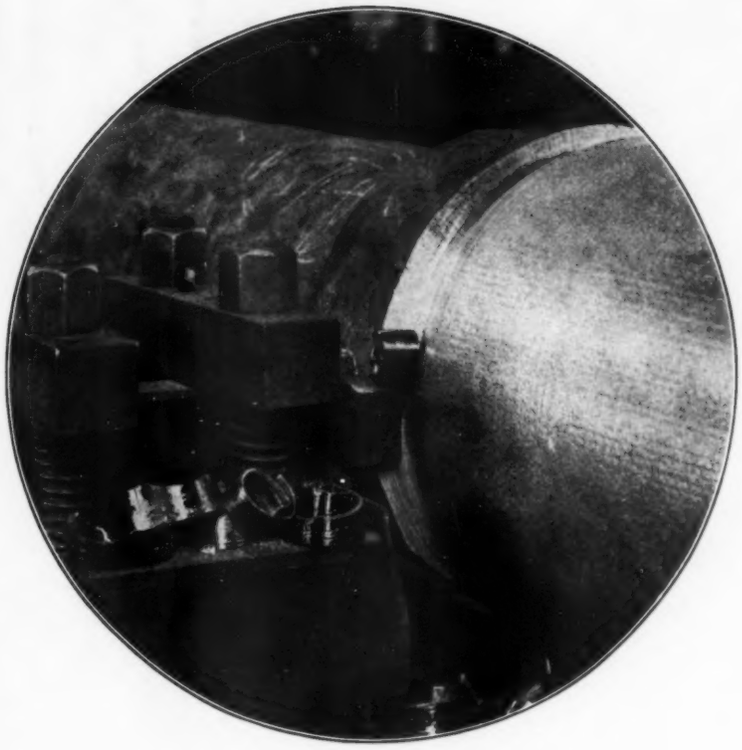
ROTOTROL—the Westinghouse patented control scheme—is responsible for the high rate of acceleration and retardation of the planer drive and the correspondingly greater output. The Rototrol circuit responds instantly to any change in load. As a result, planer motor speed is held constant over the entire speed range. Regenerative braking permits the table to be stopped and reversed at the precise same point every time—permitting planing up to shoulders or in blind pockets.

At the same time, a *wider* speed range (40 to 1200 rpm planer motor speed) permits cutting and return speeds to be adjusted more flexibly to the needs of the job—whether high precision die work or rough bedplate machining.

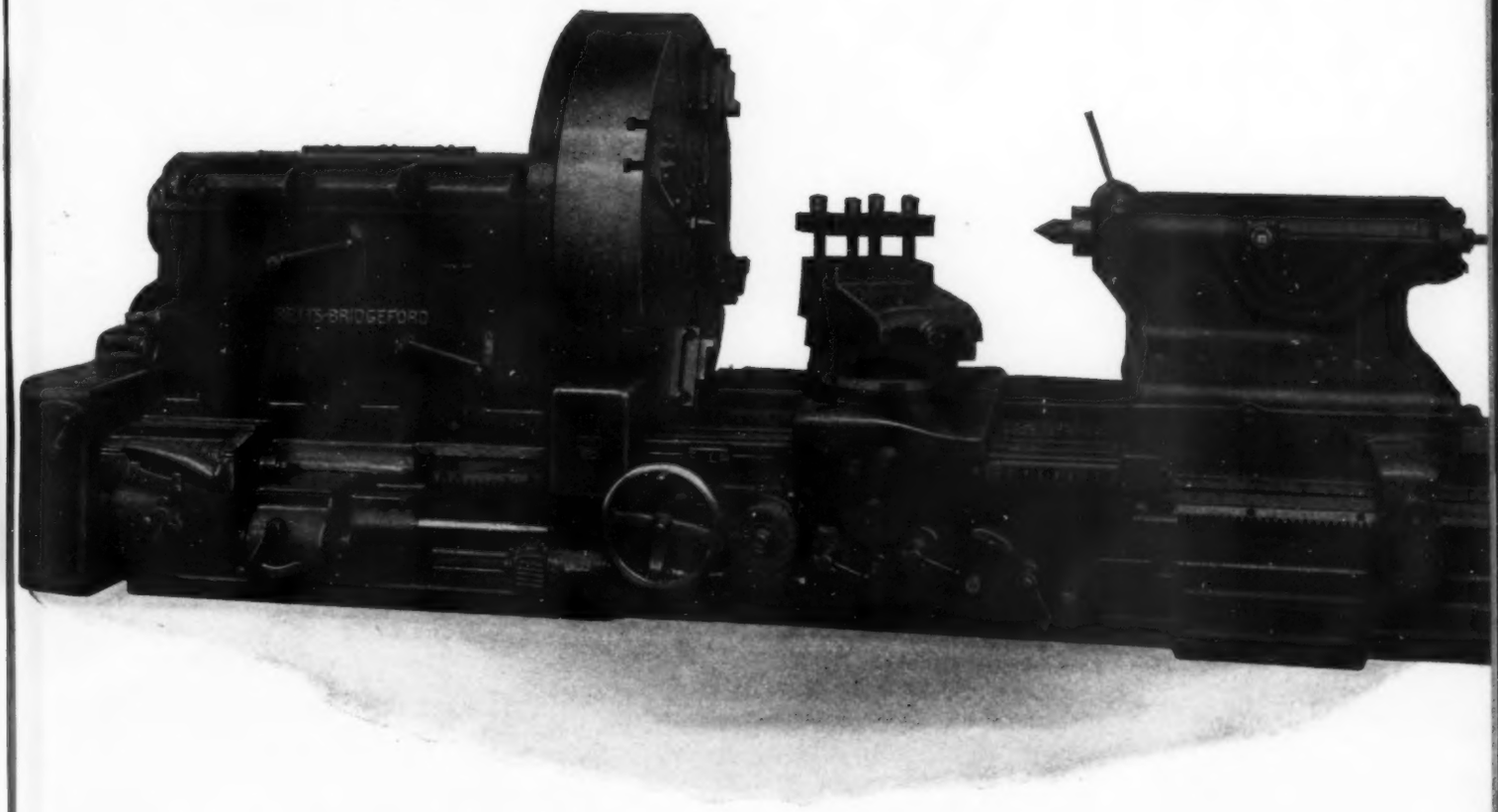
Ask your Westinghouse representative or write today for full details on this simpler, faster planer drive! Address Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-21204

Westinghouse VARIABLE VOLTAGE DRIVES

BETTS-BRIDGEFORD



A name universally recognized as the leader in medium and large lathes for fast and economical production. The 60" lathe shown below is similar to those producing gratifying results today in the Victory Program.



BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

RIGHT TO

TON THE NOSE!

Bomb-sights give American bombers the accuracy that enables them, in spite of speed, height and distance, to hit their targets "right on the nose".

What bomb-sights are to our fighting bombardiers, Micrometer Dials on Monarch Lathes are to the thousands of operators who are working furiously to build more and more planes for our Army, Navy and Marines. With these and other Monarch features, war workers save precious time and turn their jobs faster to the close tolerances required.

The rigidity and accuracy built into Monarch Lathes give them the stamina and dependability required for 'round-the-clock operation. They are helping our thousands of War plants to hit their Victory schedules—"right on the nose".

THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY, OHIO

Proved accuracy of Micrometer Dials and Micro-Gauging Dials, large in diameter, with easy-to-read graduations in diameters instead of radii, save operator time, result in faster and more accurate production.

"Hogging work or finest finishing . . . we put our faith in Monarch Dials"

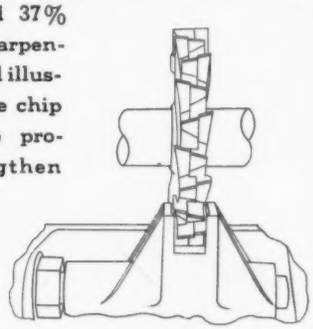
The Enterprise Tool & Mfg. Co., at Newark, N. J., produces jigs and fixtures as airplane subcontractors. They've used Monarch Lathes since 1929 — with new ones added in 1934, 1940, 1941 and 1942. One of these new Monarchs produces twice as much of the same work as the lathe it replaced. The extreme rigidity and accuracy of these lathes enable them to do the heaviest hogging work or the finest finishing cuts with unvarying precision. To use their own operators' words—"Monarchs hit it 'right on the nose'."

MONARCH LATHES

COVER THE TURNING FIELD

FOR HEAVY SLOTTING..

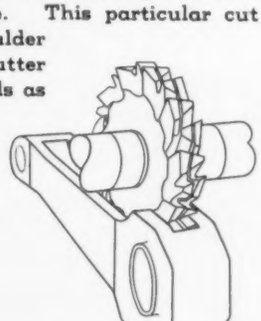
The sketch illustrates an example of deep slotting with a new B-C Interlocking Cutter. The piece is a cast steel transmission fork with a slot 1¼" wide and nearly 1⅞" deep, removing ⅛" on each face. By changing from a herring-bone type cutter to the new B-C Interlocking Cutter, production was materially increased with greater feed and speed, and the cutter, in addition, delivered 37% more pieces per sharpening. This is a good illustration of how free chip flow can improve production and lengthen cutter life.



NEW BARBER-COLMAN INTERLOCKING CUTTER

FOR DEEP BLIND CUTS..

This sketch illustrates how a new B-C Interlocking Cutter is successfully used in milling the slots on the master connecting rod of a radial airplane engine. This particular cut goes well into the shoulder of the rod, yet the cutter never hesitates or stalls as the cut gets deeper and heavier. *Free flow of chips* across the teeth permits new B-C Interlocking Cutters to handle jobs that would completely stop the ordinary type of cutter.



ADVANCED design produces an interlocking cutter having the advantages of a staggered-tooth type. On the conventional interlocking side mill, the face edges form a vee which may pocket chips and cause early dulling. Now, with virtually continuous tooth edges, *free flow of chips* across the teeth is obtained, with much longer life for the cutter. Tools of this type are recommended for long deep slotting in steel, and are especially adapted to shoulder cuts. Depth of cut may be taken up to the hub in many cases, without stalling the cutter. For specific recommendations on this patented design and all other types of B-C Milling Cutters, consult your Barber-Colman representative.

BARBER B-C COLMAN PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 201 Loomis Street, Rockford, Illinois, U. S. A.

AFTER THE WAR— NO DEPRESSION

We look down the road and plan for the dawn of that better day when peacetime needs will once more be the first line of activity of American industry and labor. It is evident that the enormous capacity of our new plants and modern equipment will permit America, for the first time, to make enough of all kinds of goods to go around to *all* our people.

Post-war costs can be very low because these new factories will be "charged off" by the time the war is over. Furthermore, craftsmanship is on the increase and working with the hand is no longer looked down upon. A vast reservoir of new and improved products will be ready to flow into every corner of the land if the profit motive and the American enterprise system prevail. We cannot tolerate another prolonged depression, interference with business or an economy of scarcity.

There are two schools of thought that are advocating methods of continuously spreading our production among our people. Under one plan, certain academic thinkers would limit production, would subsidize the incompetent plant, the national debt would continue to mount and the profit motive would be stifled. Our capitalistic system and democratic processes could not long endure such a plan.

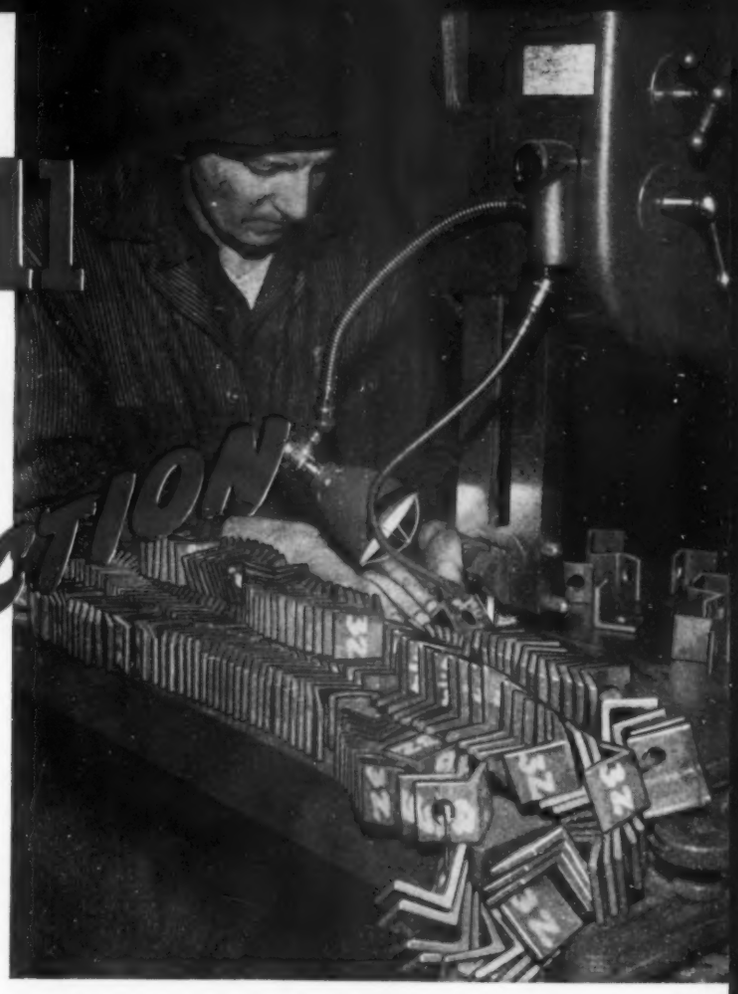
Another school of thought favors unrestricted free enterprise, elimination of monopolies, corrections of restraints caused by patents, cessation of uneconomic deterrance by unions, a tax program that would encourage new enterprise and a free competitive productive economy.

Business management is putting its house in order for post-war productivity that will be possible if the "doers" and not the politicians predominate in planning.

* * * * * *

For peace adaptability, the new process known as Contour Sawing is ideal. Without a single change, each DoAll can be put to work catching up on the vast array of civilian goods that will be in demand as soon as the last shot is fired.

DoAll WINS THE BATTLE OF PRODUCTION



DoAll saved 18 hours on this job. Production cutoff of angle irons. Former method, torch and grind-off burr.

● Out of the great American caldron they come in ever-increasing quantities — tanks, planes, jeeps, helmets, guns, bullets.

Behind the allied fighting forces stretch miles of production lines, thousands of modern machine tools, millions of workers on the job 24 hours a day.

Wherever you go you'll find DoAll, the lightweight machine tool that saws through any metal or alloy—steel blocks a foot thick, bars, flats, sheets, tubing, etc. Occupies small space—can be shoved into the regular work line to relieve heavy millers and higher priced shapers of overload work. Cuts out special parts and tools without dies. Saws 70 to 80 shapes at one time from stacked sheets.

DoAll is the fastest precision method to remove metal. Does a week's work in a day—a day's work in an hour—an hour's work in 15 minutes.

Flexing Bars for Dynamometers. Production cutting from 1" Swedish steel.

Cutting openings in 12 gauge 48" steel tank covers.

IN WAR OR PEACE

DoAll can save you valuable time and money. Let a factory-trained man come to your plant and in a few minutes, show you many ways in which DoAll can increase your production.

NEW BOOK

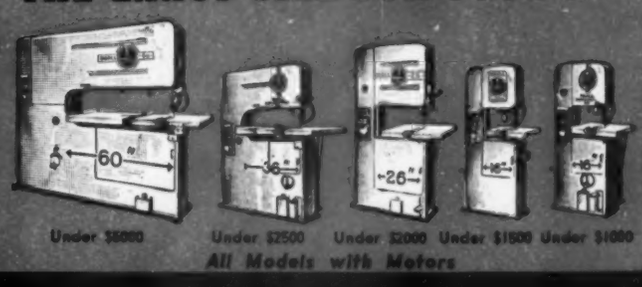
—Case histories of DoAll performance. Photographically told, with short sentences, for busy executives. Send for copy.

CONTINENTAL MACHINES, INC.

1310 S. WASHINGTON AVE., MINNEAPOLIS, MINN.

Associated with the DoAll Company, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines

THE EXACT SIZE FOR YOUR JOB



CURTISS-WRIGHT installs HPM FASTRAVERSE PRESSES in their New Airplane Plants

The Curtiss "Helldiver"

Forming "Dural" Aircraft parts with a 2500-ton HPM Rubber Pad Press. Four individual loading stations permit continuous press operation . . . no time out for loading and unloading!

Rubber pad size . . . 96"x 48".

Two 500-ton HPM Metal Drawing Presses form gasoline tanks and other parts requiring deep draws. Each press is equipped with a 175-ton hydraulic die cushion, located in press bed.

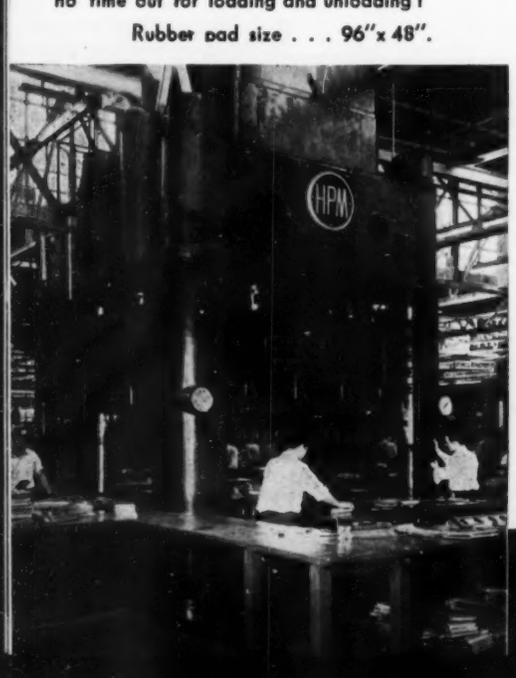
Max. die space (L-R x F-B) - 72"x 48".

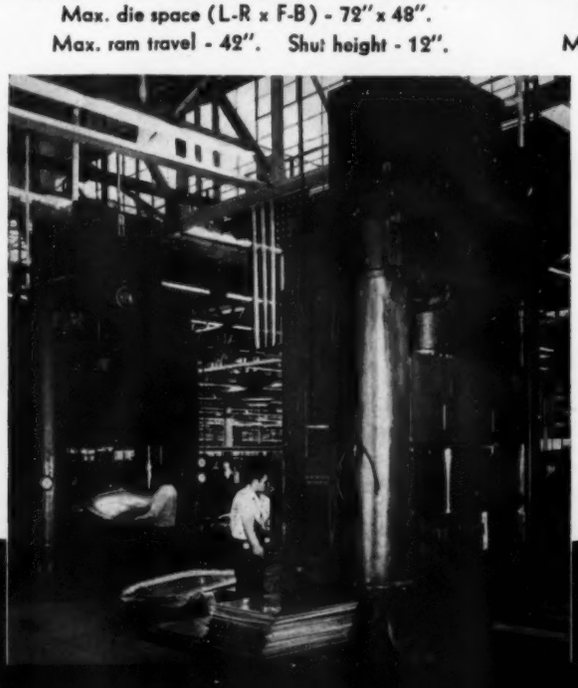
Max. ram travel - 42". Shut height - 12".

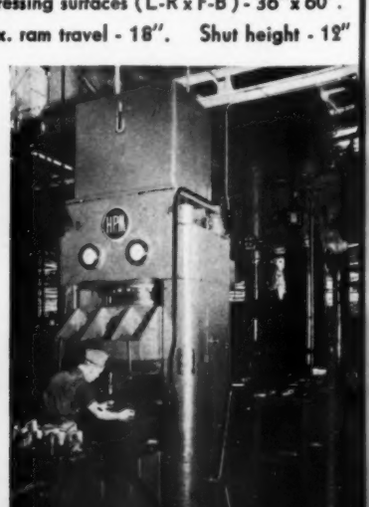
This 300-ton HPM Single-Action Hydraulic Pre equipped with rubber pad, has proved ideal ba as an experimental and small production un

Pressing surfaces (L-R x F-B) - 36"x 60".

Max. ram travel - 18". Shut height - 12"

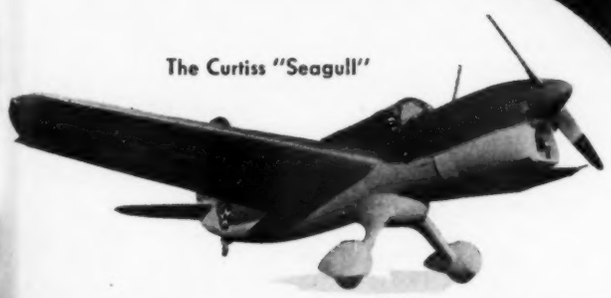






Industry

The Curtiss "Seagull"



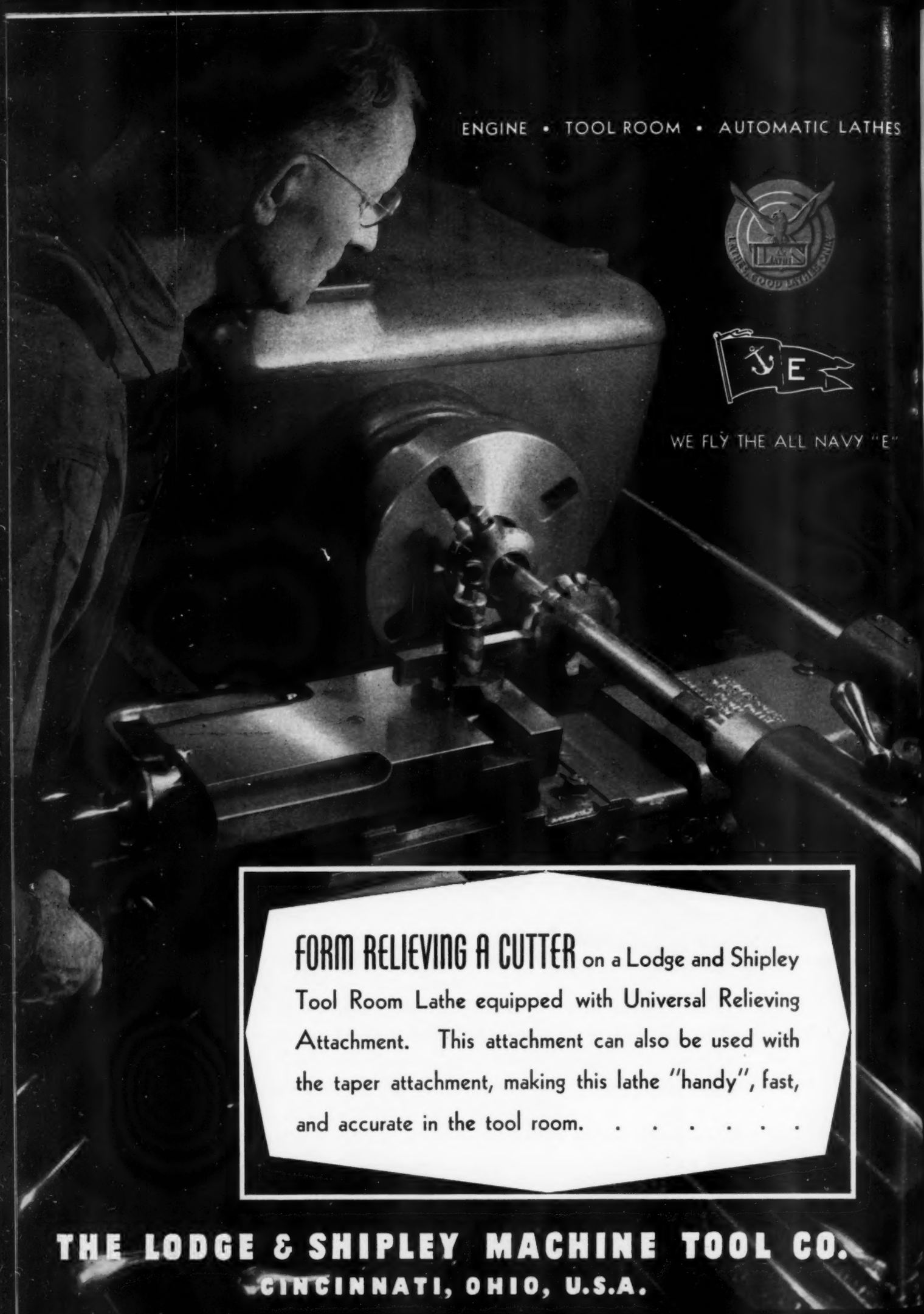
The application of HPM Self-contained Hydraulic Presses is the accepted method for producing metal aircraft parts. There is an HPM FASTRAVERSE PRESS for every aircraft forming and drawing job, regardless of whether rubber pads or regulation dies are used. ● One of the many important features of HPM Fastraverse Presses is that they are designed and built for 24 hour service, year in and year out! The exclusive HPM Radial, Piston Type, Hydraulic Pump and HPM Closed Circuit Operating System are HPM's guarantee to uninterrupted press service.

THE HYDRAULIC PRESS MANUFACTURING COMPANY, MOUNT GILEAD, OHIO, U. S. A.

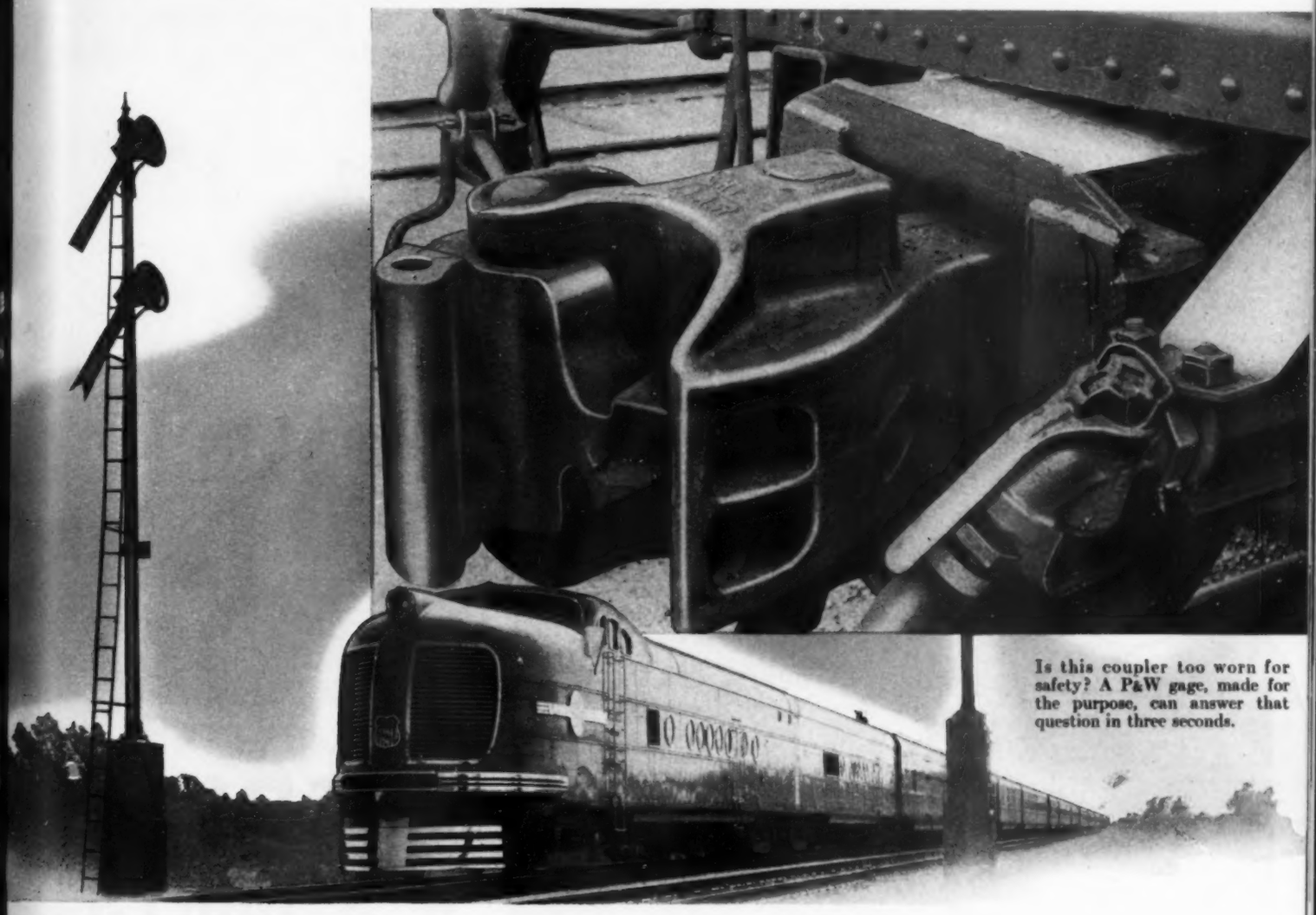
Pioneer Builders of Presses for the Aircraft Industry

District Sales Offices: New York, Syracuse, Detroit and Chicago. Representatives in Principal Cities

try relies on H·P·M HYDRAULIC PRESSES *to "keep 'em flying*


ENGINE • TOOL ROOM • AUTOMATIC LATHES
WE FLY THE ALL NAVY "E"
FORM RELIEVING A CUTTER on a Lodge and Shipley Tool Room Lathe equipped with Universal Relieving Attachment. This attachment can also be used with the taper attachment, making this lathe "handy", fast, and accurate in the tool room. . . . . .
THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.

One of our TOUGHEST CUSTOMERS



Is this coupler too worn for safety? A P&W gage, made for the purpose, can answer that question in three seconds.

This gage shows how much metal must be removed to restore the original wheel contour, and how much service metal will be left.

IF you were going to create a railroad . . . build your own locomotives, cars, signal systems, and all the rest . . . about the first source of supply you'd seek out would be Pratt & Whitney. One way or another, you'd need almost the whole wide range of P&W products. Our big, super-accurate Keller machines, jig borers, lathes, shapers, and grinders go into many phases of locomotive and rolling stock manufacture. Our cutting tools — many like staybolt taps, bridge reamers, mud taps, milling cutters — are made expressly for railroads — used in both manufacturing and maintenance. Our gages serve all along the line . . . right from building to accurate standards to checking wheels and couplers in service.

P&W accuracy keeps 'em rolling *longer, faster, safer*. Our engineers have long worked closely with the Association of American Railroads — tough customers who won't even look at anything but the best. They talk our language — they recognize the value of accuracy. They're vital to Victory . . . we'll help them do their part.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

Supporting the Home Front's Production

FOSDICK H. S. DRILLS

New designs in tools, jigs, fixtures are constantly being developed to improve and increase production of vital material for War.

Tool and Die Shops throughout the Nation are working 24 hours a day to speed improved tooling methods to production plants.

Fosdick H.S. Drills are being used by the hundreds to speed these new tools to the various shops.

Illustrated is Fosdick High Speed Drill in a mid-west tool shop where it performs drilling, reaming, boring and facing operations on a wide range of work.

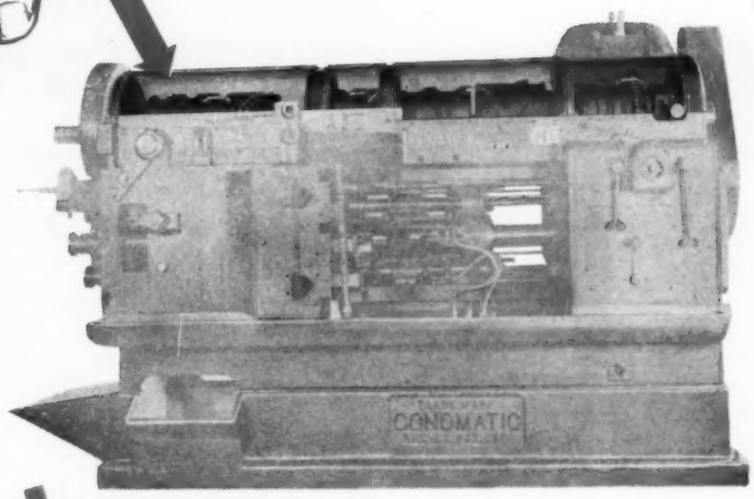
With a single speed motor 6 and 9 speeds are obtained; and with a two-speed motor, 12 and 18 speeds are obtained. Capacity up to $1\frac{1}{4}''$.

For speed, accuracy and high production use. Fosdick H.S. Drills.

Complete details will be found in the Fosdick Bulletin H.S.A. Write for it.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI ••• OHIO

YOU COULD FIND THEM IN A BLACKOUT



CONE CAMS ARE SO ACCESSIBLE

There is no question about the accessibility of Cone Cams. They are all on cam drums on *one* Camshaft, which runs the full length of the machine — in the rugged top bed, above the work area, free from falling chips and protected from dirt and foreign material.

As this feature places Cone Cams always within easy reach of the operator, it facilitates quick changeover. The clear visual picture of the cams in actual operation assists the new operator to more quickly know his machine.

The Cone Over-Head Camshaft is but one of the advantages identifying Cone Departmental Design, and, from the time of its inception, has marked a step forward in multiple spindle automatic construction.

If your production-pulse needs priming it will pay you to specify Cones.

CONE AUTOMATIC MACHINE CO., INC.
Windsor, Vermont, U. S. A.

FIRTHITE

T-04

TUNGSTEN-TITANIUM CARBIDE

THE NEAREST APPROACH IN TOUGHNESS AND STRENGTH TO HIGH SPEED STEEL YET DEVELOPED IN A CARBIDE

EASY TO GRIND—Firthite T-04 will take a keen, smooth edge and can be ground to steep rakes and clearances with deep chip-curling grooves.

UNIQUE—Firthite "GRADE T-04" Tungsten-**Titanium** Carbide is a **Firth-Sterling** development—the result of years of research. It sets new performance standards. T-04 is especially recommended for heavy duty, interrupted cuts, coarse feeds, etc.

UNIVERSAL IN APPLICATION—Firthite T-04 is the closest known approach to a **universal grade** of carbide. It approximates high-speed steel in **toughness** and **strength.** Production records show that T-04 gives uniformly fine performance in such varied applications as cutting armor plate, roughing softer steels, machining both cast iron and chilled cast iron—also other metals.

WILL STAND ABUSE—Firthite T-04 is tough, strong, wear-resistant. It withstands abuse from intermittent cuts, old machines, excessive overhang, inexpert operators, etc.

GOOD FOR INEXPERIENCED TRAINEES—Because Firthite T-04 does not require extra care in operation, it is the logical choice for training new operators in the use of sintered carbides. It is also ideal for any new application.

CONTAINS TITANIUM—The **Titanium** ingredient in T-04's composition plays a triple role: (1) converts an otherwise ordinary tungsten-carbide grade into a star performer in cutting steel; (2) lowers the price to you; (3) precludes any possible shortage, since **Titanium** is the ninth most plentiful mineral and the domestic supply is more than ample for ALL requirements.

WHATEVER you are machining, use FIRTHITE. It's aces! Besides T-04, other grades of Firthite Tungsten-**Titanium** Carbide are available and will likewise SAVE YOU MONEY. They cover the entire field of Steel Cutting with maximum efficiency. **GRADE TA** is for general use on certain steels.

GRADE T-16 is for light, rapid finishing of harder steels.

REMEMBER—a pound of Tungsten used in FIRTHITE does many, many times the work of a pound of Tungsten used in high-speed steel.

TOOL STEELS AND CARBIDES FOR COMPLETE SHOP TOOLING

Firth-Sterling

STEEL COMPANY

OFFICES: McKEESPORT, PA. NEW YORK HARTFORD LOS ANGELES CLEVELAND CHICAGO PHILADELPHIA DAYTON DETROIT

YOUR BEST BET

FOR

Anytime

IN WAR OR PEACE—

you can depend on Morse Silent and Roller Chain Drives to provide capacity and stamina to keep maximum production rolling, free from costly maintenance or breakdowns.

Reliability and high efficiency in capacities from fractional to thousands of horsepower.

That is what all big production needs.

SILENT CHAINS · ROLLER CHAINS · FLEXIBLE COUPLINGS · CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.

RUGGED AND FAST!

★

THE FAMOUS
MAXIMILLER
for PRODUCTION NOW!

★

OUTSTANDING
IN THE 54-YEAR
HISTORY OF

KEMPSMITH

MILLING MACHINE

KEMPSMITH MAXIMILLER

For PRODUCTION *Now* AND IN THE FUTURE —

MAXIMILLERS have what it takes for the grim battle of PRODUCTION NOW in our VICTORY OFFENSIVE . . . because MAXIMILLERS have that surplus of sturdiness needed for heavier cuts (free from dangerous deflection or vibration); increased range of speeds and feeds; more power; longer accuracy; compact design; centralized control; and many other KEMPSMITH advantages. Sizes No. 2 to 5. . . Vertical and Horizontal (Plain or Universal).

PRECISION

MILLING MACHINERY

Experience SINCE 1888

KEMPSMITH MACHINE CO.

MILWAUKEE • WISCONSIN

The Long Range Point of View

In common with all other industrial concerns, we at The Cleveland Punch and Shear Works Company are keeping the wheels turning day and night to fill our orders and meet promised delivery dates.

But we, too, are thinking about tomorrow, and, even in the stress of the present emergency, are determined to maintain that quality inherent in all Cleveland Presses, to the end that machines built to meet present day requirements will continue to serve industry efficiently in the post war period, when that time comes.

This is the long range point of view which has for the past sixty years, been synonymous with the name CLEVELAND.

The large illustration shows a Modern Cleveland 4 Point Press having a capacity of 750 tons, stroke 30", adjustment 6", Bed area 80" x 144", shut height 60" and operates at 14 strokes per minute.

The smaller illustration shows a Modern Cleveland 4 Point Press having a capacity of 750 tons, stroke 30", adjustment 6", Bed area 80" x 120", shut height 60" and operates at 14 strokes per minute.

Modern Presses THE CLEVELAND PUNCH & SHEAR WORKS COMPANY *Cleveland, Ohio*

NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

REMOVING PRODUCTION BOTTLENECKS WITH . . .

P&J AUTOMATIC CHUCKING EQUIPMENT

Outstanding achievements in fast floor-to-floor time are being realized by P&J Automatics in the production of duplicate parts for war needs.

These accomplishments have in many cases been made possible through the wide flexibility in set-up offered by P&J Automatic Chucking Machines so that all roughing and finishing operations can be handled in a single cycle. As a result, bottlenecks are being avoided through the application of P&J tooling to the production of parts for airplanes, aircraft engines, tanks, Borfors guns, anti-aircraft guns, machine guns, adaptors for shells and the American-made Oerlikon gun.

By avoiding production bottlenecks, P&J machines are contributing to stepped-up defense production.

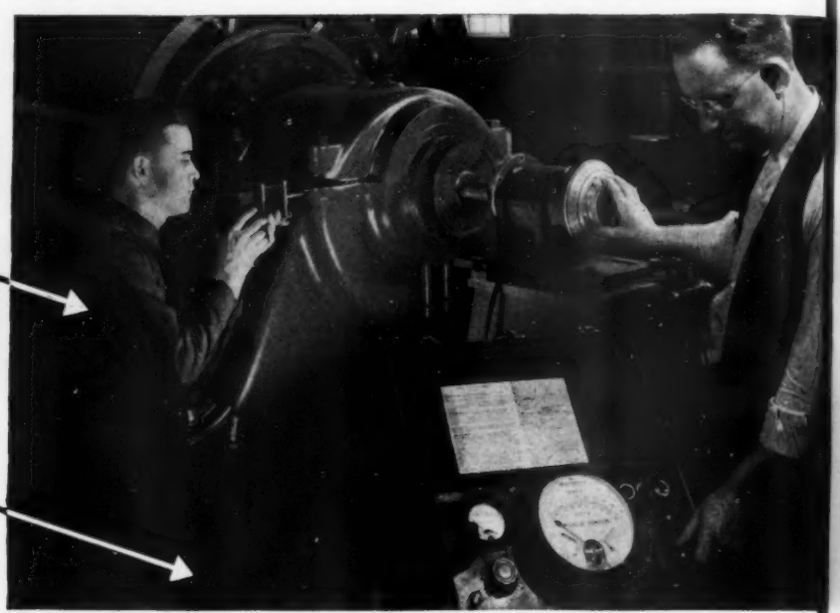
PHOTO BY U. S. ARMY

THE POTTER & JOHNSTON MACHINE CO.

Pawtucket, R. I.

HERE COMES THE "DOCTOR OF BALANCE"!

A portable unit which answers the need for balancing large rotating parts under actual operating conditions.



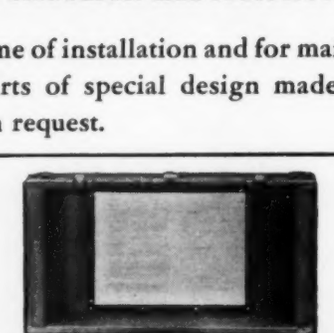
PORTABLE WATTMETER TYPE BALANCING MACHINE

Product of The Westinghouse Research Laboratories

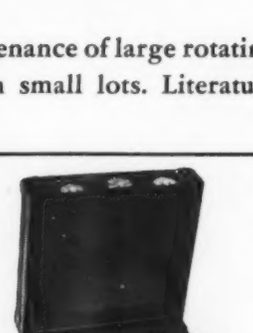
NOW, in two convenient carrying cases, you can bring the balancing equipment to the machine . . . to locate, measure, and correct unbalance in rotating parts at their rated speeds . . . on their own bearings . . . under actual working conditions.

Using a simplified balancing procedure known as the "Wattmeter" method, this unit records both amplitude and phase angle of vibration, enabling you to determine the points of unbalance and corrective weights needed. Available for balancing parts operating at speeds between 100 and 10,000 RPM.

Not to be considered a production machine with other Gisholt Balancing equipment, the Portable Unit is recommended for use in checking proper balance at the time of installation and for maintenance of large rotating parts of special design made in small lots. Literature on request.



Metering unit is self-contained, protected in carrying case.



Sine Wave generator shaft and pick-up unit.

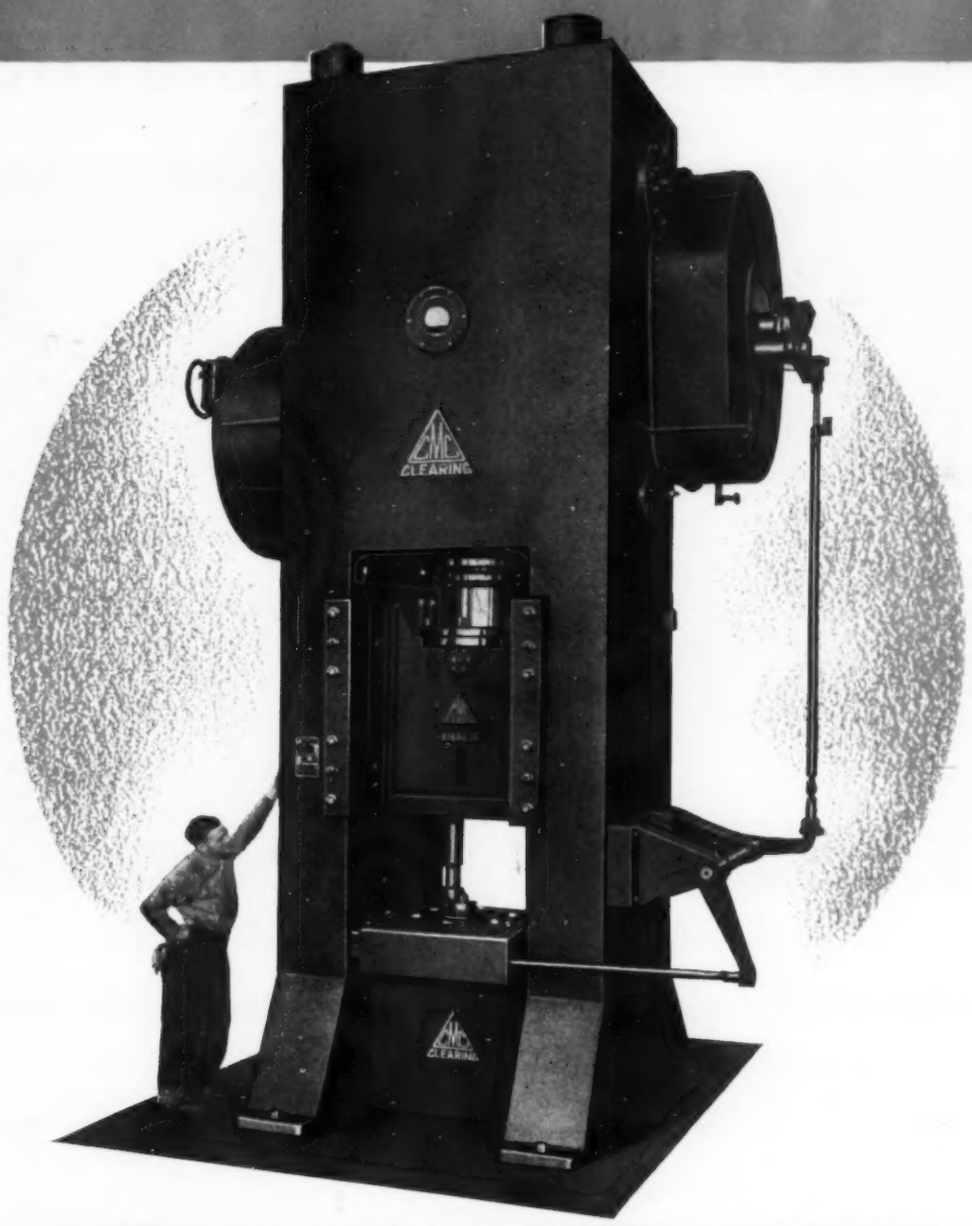
GISHOLT

GISHOLT MACHINE COMPANY, 1201 East Washington Avenue • Madison, Wisconsin

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT IMPROVEMENTS

TURRET LATHES · AUTOMATIC LATHES · BALANCING MACHINES

SAVE VALUABLE PRODUCTION TIME



WITH A CLEARING PRESS

THE continuous operation of this 600 ton CLEARING Knuckle Joint Mechanical Press is all important. Repairs must be minimized. Included in the design of this press are many safeguards from repairs, a few of which are all welded steel frame, slide doubly guided in crown and gibs, all rotating parts running in a bath of oil, and improved type of solenoid valve controlled air clutch and brake that prevents slipping, heating and excessive wear on the linings.

Equally important, this press must meet the exacting requirements necessary for heading and indenting 37 mm. cartridge cases.

Dependability, accuracy of design, and speed in production are a constant in CLEARING Presses.

Clearing Machine Corporation
6499 West 65th Street, Chicago, Illinois

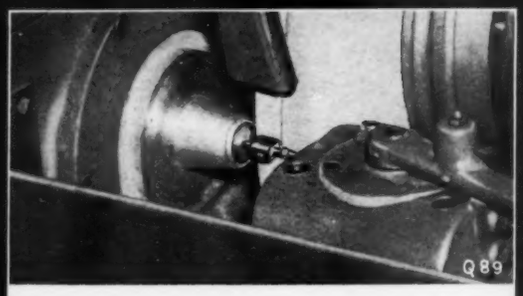
MECHANICAL AND HYDRAULIC PRESSES

CLEARING
MACHINE CORPORATION
CHICAGO

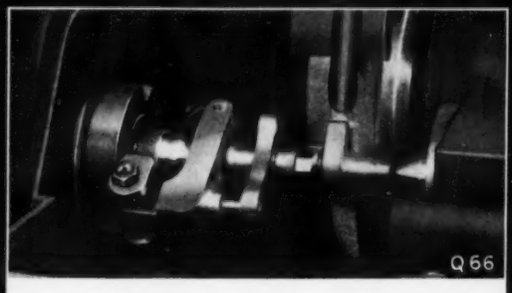
TO FINISH THE JOB QUICKER . . .

GRIND SMALL CAMS WITH EQUIPMENT LIKE THIS

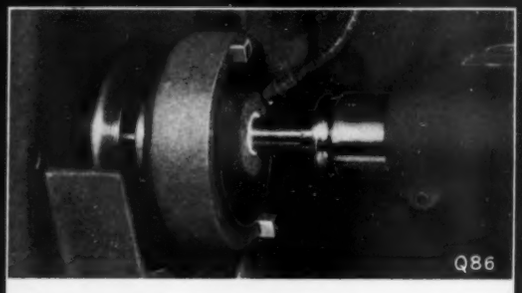
An ignition timing cam being ground on a Landis 6" x 18" Type C Plain Grinder using a loose cam grinding attachment.



A small rotor being relief ground on a Landis 6" Type C Plain Grinder equipped with an integral cam grinding attachment.



A small integral cam being ground on a Landis 12" x 36" Type LC Universal. An integral cam grinding attachment is used.

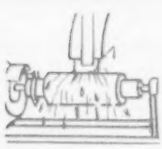


A cam used in the manufacture of aircraft being internal ground on a 12" Type LC Universal, using a loose cam grinding attachment.

Why invest in costly specialized equipment for the grinding of small cams when you can perform the same operations on Landis Cam Grinding Attachments such as those shown above. When not in use, the attachment can be removed and the otherwise perfectly standard machine can be used for conventional operations.

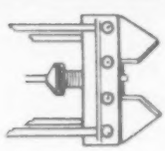
Unusual PRECISION LANDIS GRINDERS Performance as Usual

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.



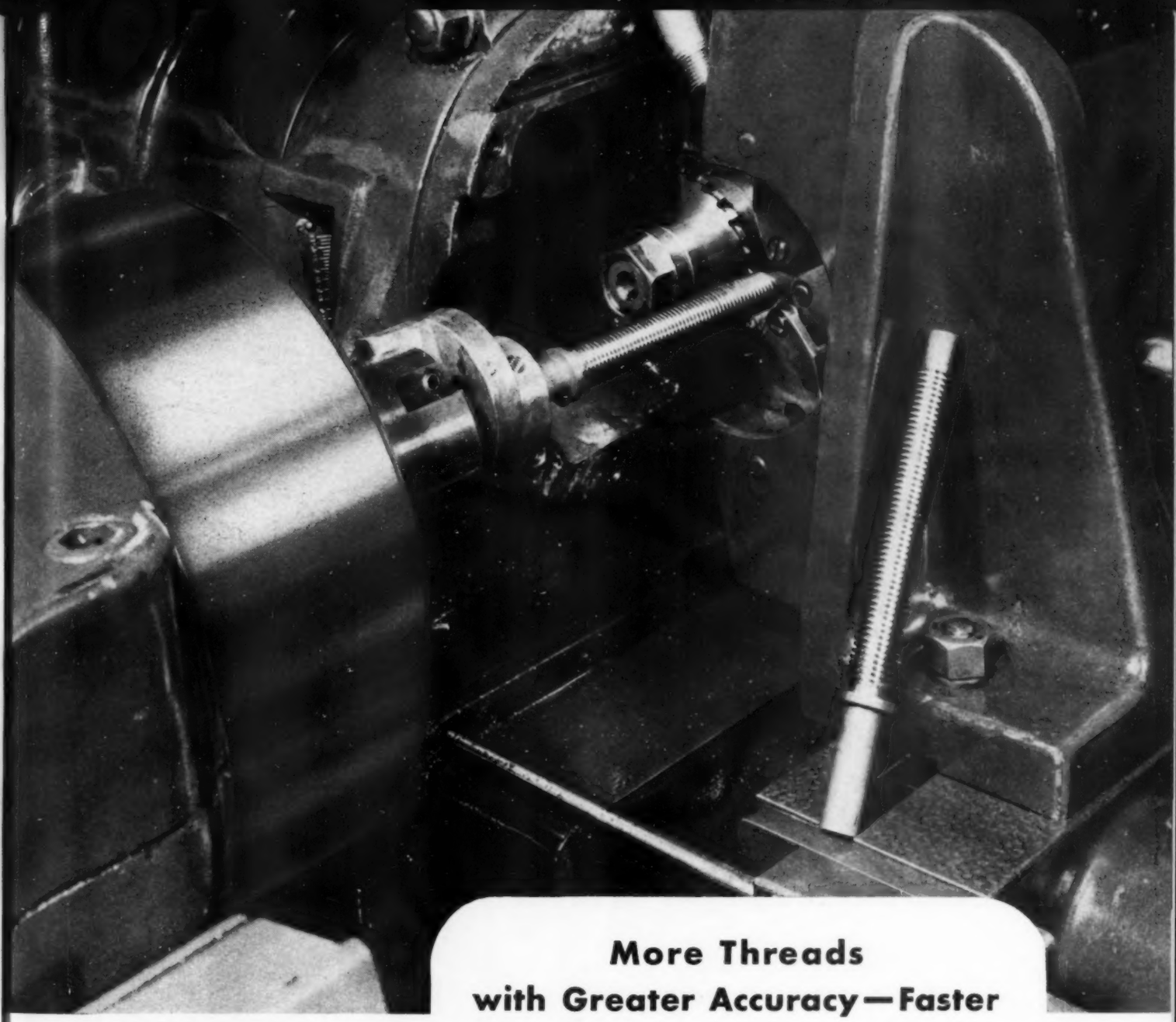
FIRST TO USE A COOLANT SYSTEM AS INTEGRAL PART OF GRINDING MACHINE.

FIRST TO SUCCESSFULLY APPLY HYDRAULICS TO GRINDING MACHINES GENERALLY.



FIRST TO DEVELOP MANY NEW FEATURES SUCH AS LANDIS-SOLEX SIZING.

397



More Threads with Greater Accuracy—Faster

Lees-Bradner HT Thread Miller

● The Lees-Bradner Model HT Heavy Thread Miller is employed primarily for the generation of threads on larger, heavier work. However, when the occasion demands, the machine's extreme versatility permits the economical handling of parts similar to the landing gear actuating screw illustrated, a feature of especial value in the solution of vital wartime threading requirements.

Lees-Bradner
HT
THREAD MILLER

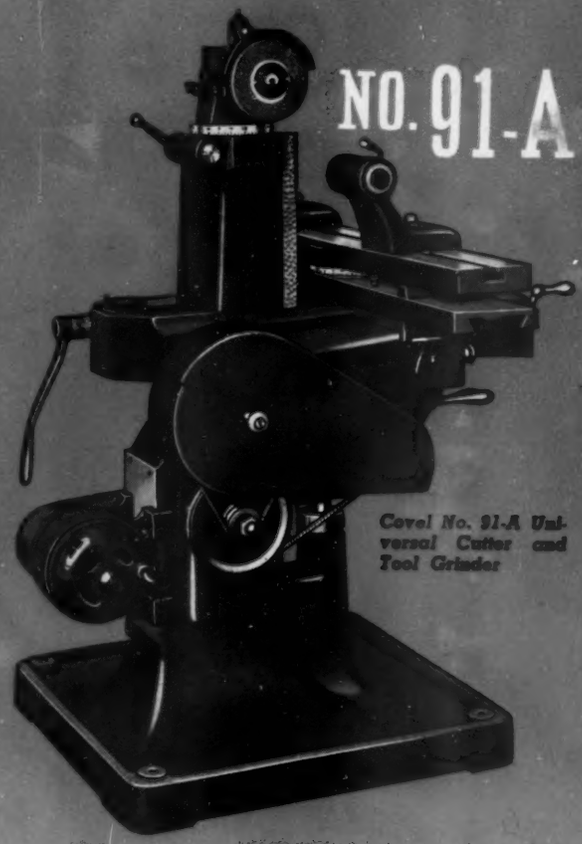
The LEES-BRADNER Company
CLEVELAND, OHIO, U.S.A.

TAPS ARE WAR WEAPONS *Save them!*

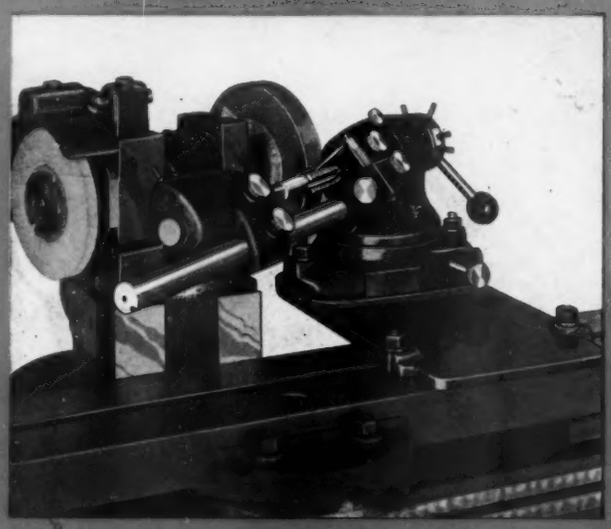
Let's help play "taps" for the Axis by making taps and cutters last their full life! These vital tools will serve "full-time" only if they're properly sharpened—and proper sharpening is simple and fast on the *Covel No. 91-A* Universal Cutter and Tool Grinder. Covel tool grinding assures uniformly accurate work throughout your plant—valuable time saved for skilled machinists—and more "tap-time" for your tap dollar. "91-A" saves on a multitude of other tool grinding jobs, too.

(at right) COVEL NO. 2 TAP GRINDING ATTACHMENT

For accurate chamfer-sharpening of taps. Mounts on table of universal cutter and tool grinder and lines up with grinding wheel on right hand side. Small taps held with chuck. Large taps supported on centers. Flute of tap is lined up with lip rest and ground by oscillating ball handle at right up and down and then indexed to next flute. No cams, gears or collets required, but taps are ground with a true (adjustable) eccentric relief.



Covel No. 91-A Universal Cutter and Tool Grinder



This Covel No. 2 Tap Grinding Attachment described in Bulletin 740. Write today for your copy, together with Bulletin A-7232 featuring the Covel No. 91-A Universal Cutter and Tool Grinder.

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICH.

UNION

Maintain accuracy with fewer production delays! Every tool in the Union line incorporates features of design and construction based on our continuous research into tooth design, the cutting properties of tool steels, the characteristics of the newest metals and alloys and all other factors affecting efficiency in metal-working. The results of Union research are readily apparent in the longer lasting accuracy of every Union Tool . . . in the maximum production obtained from every machine that is Union-equipped.

UNION TWIST DRILL CO., ATHOL, MASS.

Union Butterfield Card

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

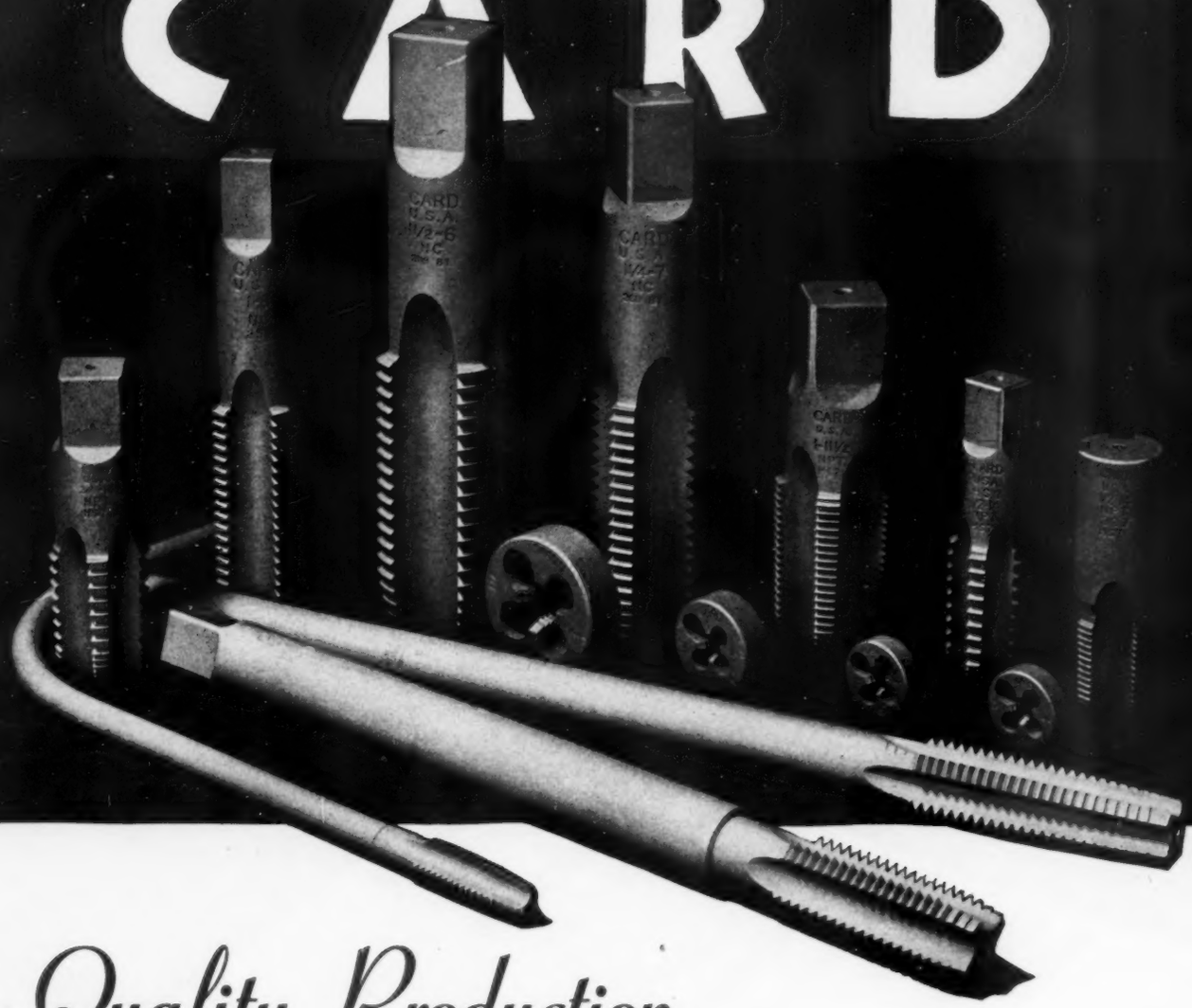
New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.

STORES

San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

Divisions of the
UNION TWIST DRILL CO.

CARD



Quality Production

—WHEN THE PRESSURE IS ON!

Under present demands for quantity production, quality must be maintained! When the pressure is on to turn out more and more defense materials, Card Taps reveal their inherent ability to turn out high quality work on a high production basis. Whatever degree of accuracy you wish . . . whatever material you work in, Card can supply the taps for quality production.

Divisions of the UNION TWIST DRILL CO.

Union Butt

S. W. CARD MFG. CO.
MANSFIELD, MASS.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
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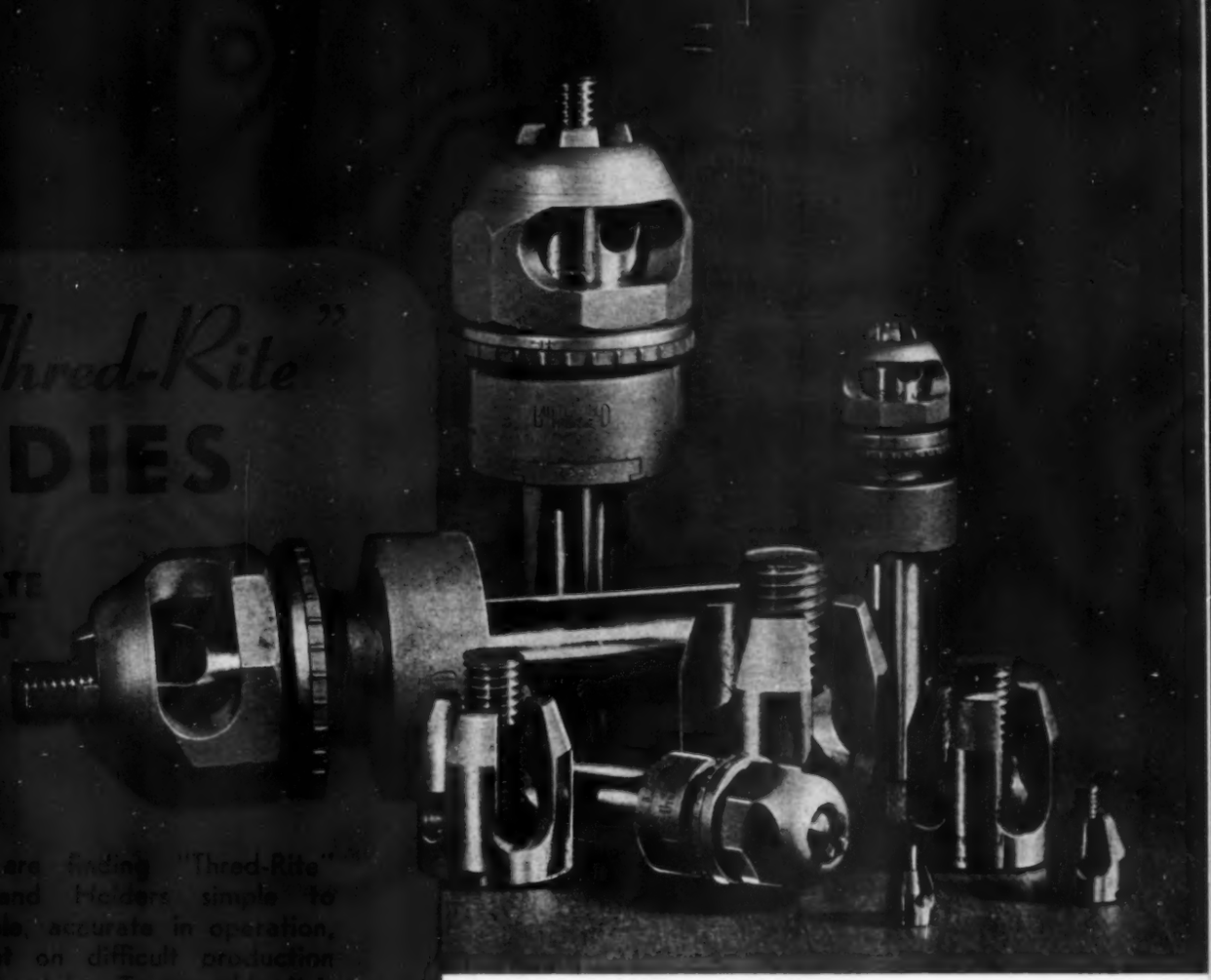


"Thred-Rite" DIES

SIMPLE
ACCURATE
EFFICIENT

Users are finding "Thred-Rite" Dies and Holders simple to assemble, accurate in operation, efficient on difficult production threading jobs. To assemble, it is only necessary to snap die onto die seat lugs and, with test stud in place, screw on adjusting cap. Rugged, full floating construction of Holders assures accurately cut, accurately centered threads. Graduations of .001" on the micrometer lock nut can be split for fine adjustment.

Severely tested in shops that are giving them the hardest kind of hard use, "Thred-Rite" Dies are proving their ability to produce accurate threads under today's high pressure operating conditions. Write to any of the addresses listed below for full information.

t erfield Card

BUTTERFIELD DIVISION
DERBY LINE, VT. **ROCK ISLAND, QUE.**

STORES: New York, 61 Reade St. Chicago, 11 So. Clinton St. Cleveland, Hal W. Reynolds, 3346 Superior Ave. Detroit, 6540 Antoine St. Los Angeles, 524 E. Fourth St. Toronto, 208 King St., West. Montreal, 111 St. Paul St., West. Winnipeg, 403 Travellers Bldg. Vancouver, 327 Shelly Bldg. Agents for Great Britain—Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S. E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

Divisions of the
UNION TWIST DRILL CO.

Precision boring and facing airplane engine part, with relationship between shoulders and flange rigidly held —on Junior Double End Machine . . . with Ex-Cell-O Universal Fixture.

Precision boring Diesel part for U. S. Navy, holding center bore concentric with O. D. and six other holes— on Junior Single End Machine . . . with Ex-Cell-O Universal Fixture.

Precision boring aircraft part to limits of ±.0002" and holding distance between large and small holes to extreme exactness—on Junior Single End Machine . . . with Ex-Cell-O Universal Fixture.

Precision finish boring machine tool part, with 11 1/16" length hole kept parallel to base and dovetail—on Heavy Duty Double End Machine . . . with Ex-Cell-O Universal Fixture.

Ex-Cell-O Universal Fixture mounted on hydraulically controlled cross-slide, an automatic feature that means increased production through time-saving in indexing.

A COMBINATION HARD TO BEAT

. . . for precision boring, turning and facing in miscellaneous lots

EX-CELL-O STANDARD BORING MACHINES and UNIVERSAL FIXTURES

MANUFACTURING plants and machine shops with a variety of jobs in different size lots can bore, turn, face and groove with extreme precision in size and finish—with the utmost economy and at a high production rate—by the use of an Ex-Cell-O *standard* Precision Boring Machine and an Ex-Cell-O *standard* Universal Fixture. The same precision in design and operation that makes the Ex-Cell-O Boring Machine a superior machine tool also features the Ex-Cell-O Universal Fixture—used together they are practical and profitable. These two standard Ex-Cell-O products are solving problems for many manufacturers—small and large—whose work calls for the speedy turning out of a variety of parts, with all the advantages that come with the use of single point diamond or carbide tools. The flexibility in application of the Ex-Cell-O Universal Fixture makes it well worth your consideration at this time.

EX-CELL-O CORPORATION • DETROIT, MICHIGAN

XLO

EX-CELL-O means PRECISION

Precisio THREAD GRINDIN MACHINE

•

Precisio BORING TURNIN and FACI MACHINE

•

Precisio LAPPIN MACHINE

•

Precisio GRINDIN SPINDLE

•

Precisio CARBIDE TOOL GRINDER

•

Precisio HYDRAUL POWER UNITS

•

Precisio CUTTING TOOLS

•

Precisio BROACHE

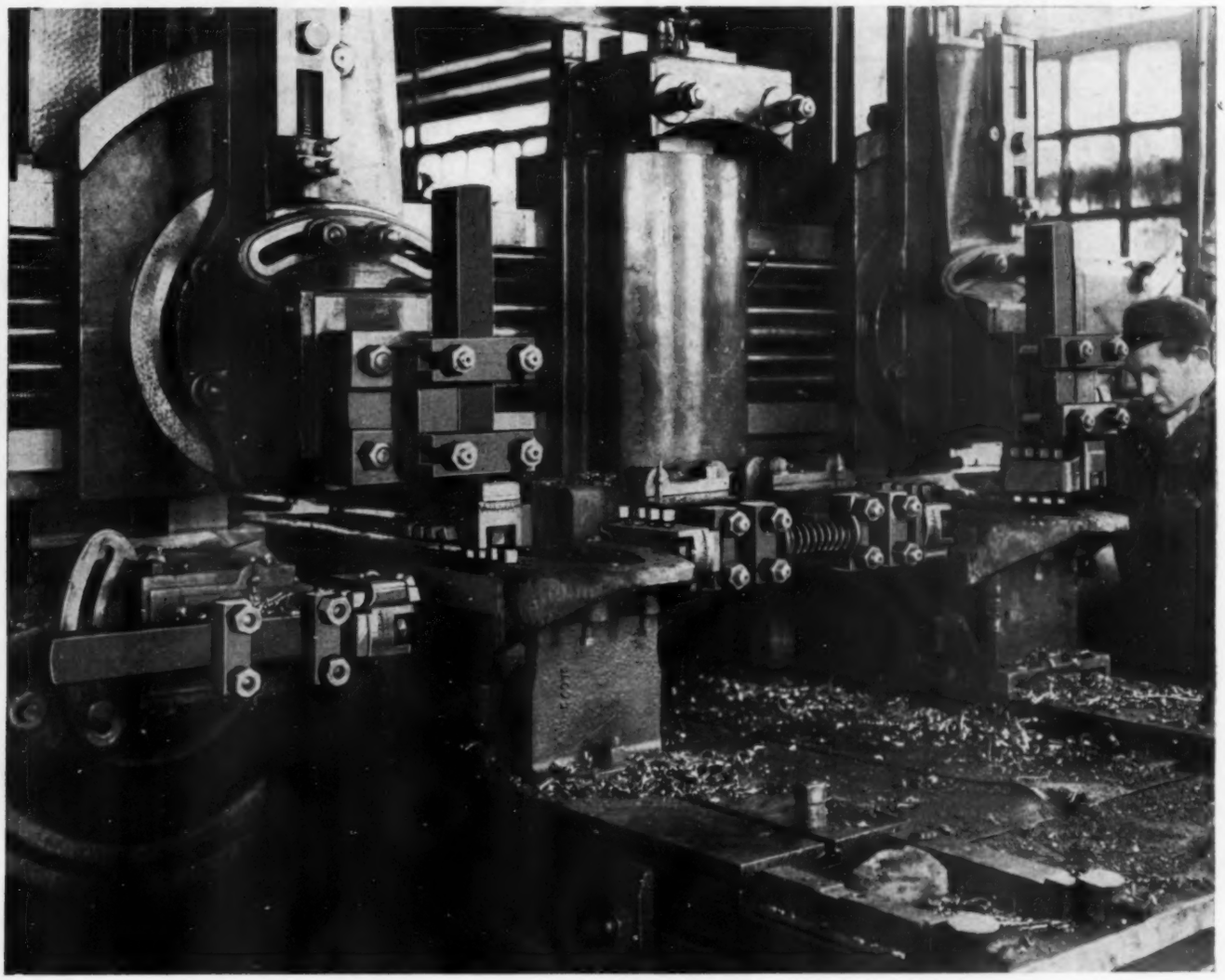
•

Precisio DRILL JIG BUSHING

•

Precisio PARTS

ARMSTRONG



Today's Apprentice with ARMSTRONG TOOL HOLDERS can out produce yesterday's "forged tool" machinist.

Today's apprentice, when equipped with the correct ARMSTRONG TOOL HOLDERS can turn out more pieces per hour than most operators produced with old fashioned forged tools because ARMSTRONG TOOL HOLDERS stand up and cut efficiently at far higher speeds and much heavier feeds than are commonly used. The "Armstrong System" comprising tool holders of over 250 sizes and shapes provides permanent efficient multi-purpose tools for every operation of lathes, planers, slotters and shapers as well as standard tools for turret lathes and screw machines. If you are using solid forged tools for operations for which ARMSTRONG TOOL HOLDERS are provided it is a safe venture that you are not getting full-capacity production from your machine tools, the maximum number of production hours from each tool, nor the full "mileage" from your high speed steel.

ARMSTRONG TOOL HOLDERS "Save: All Forging, 70% Grinding and 90% High Speed Steel," and the last of these is especially important today with high speed steel so hard to get. Write for a C-39 Catalog and with it check your present tooling methods.

Write for Catalog C-39

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Ave. Chicago, U. S. A.

Eastern Sales Office: 199 Lafayette St., New York

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

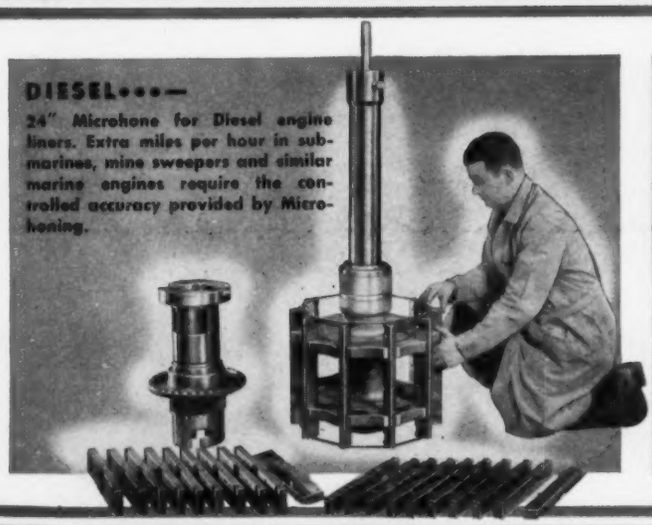
INDUSTRY SHOOTS PRODUCTION MINUTES

MICROHONING MAKES MORE HITS

SAVE TIME ★ SAVE METAL ★ SAVE COST ★ IMPROVE QUALITY ★ WITH MICROHONING

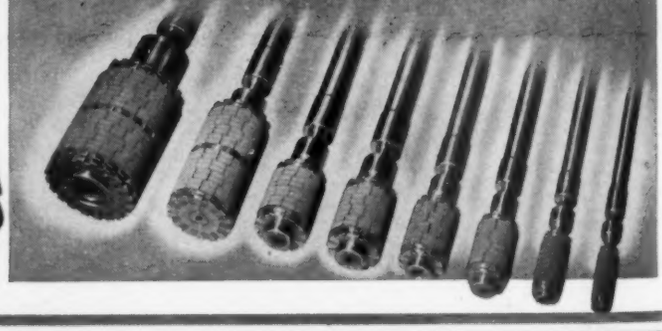
DIESEL•••—

24" Microhone for Diesel engine liners. Extra miles per hour in submarines, mine sweepers and similar marine engines require the controlled accuracy provided by Microhoning.



ORDNANCE•••—

Draw Finish Microhones. These provide a finish in recoil chamber and other bores with all machining marks co-directional with the axis of the bore. Simulating a mechanical wearing in process—this type of honing shortens or eliminates "wearing in" in service.



ORDNANCE•••—
Large Microhones for gun barrels.

Micromatic Hones have lowered the time required for final sizing and surface finishing operations from days and hours to minutes and seconds.

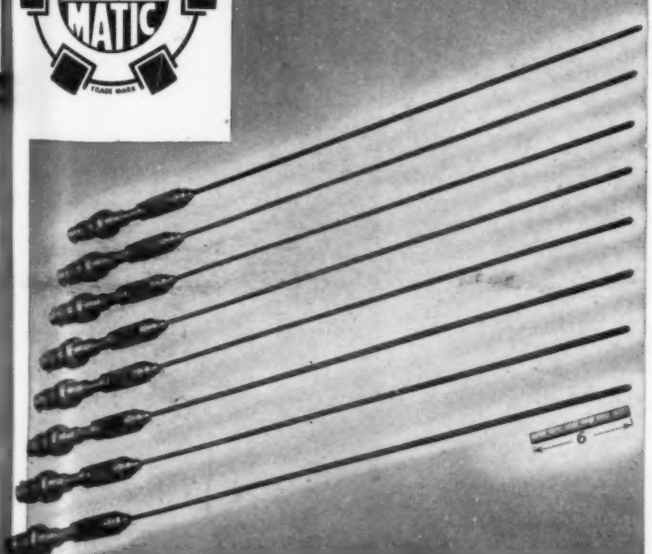
Microhoning saves TIME COST—METAL REMOVAL—MANUFACTURING COST—AND IMPROVES PRODUCT QUALITY; which, combined, means more target hits in the tough service of WAR.

Micromatic Hones range from sizes for bores .303" to 25½" in diameter—from ¼" to 900" long. They generate geometrical and dimensional accuracy, uniform size and any desired surface finish with minimum removal of stock.

MICROMATIC HONE CORPORATION
1345 E. MILWAUKEE AVE. • • • DETROIT, MICH.

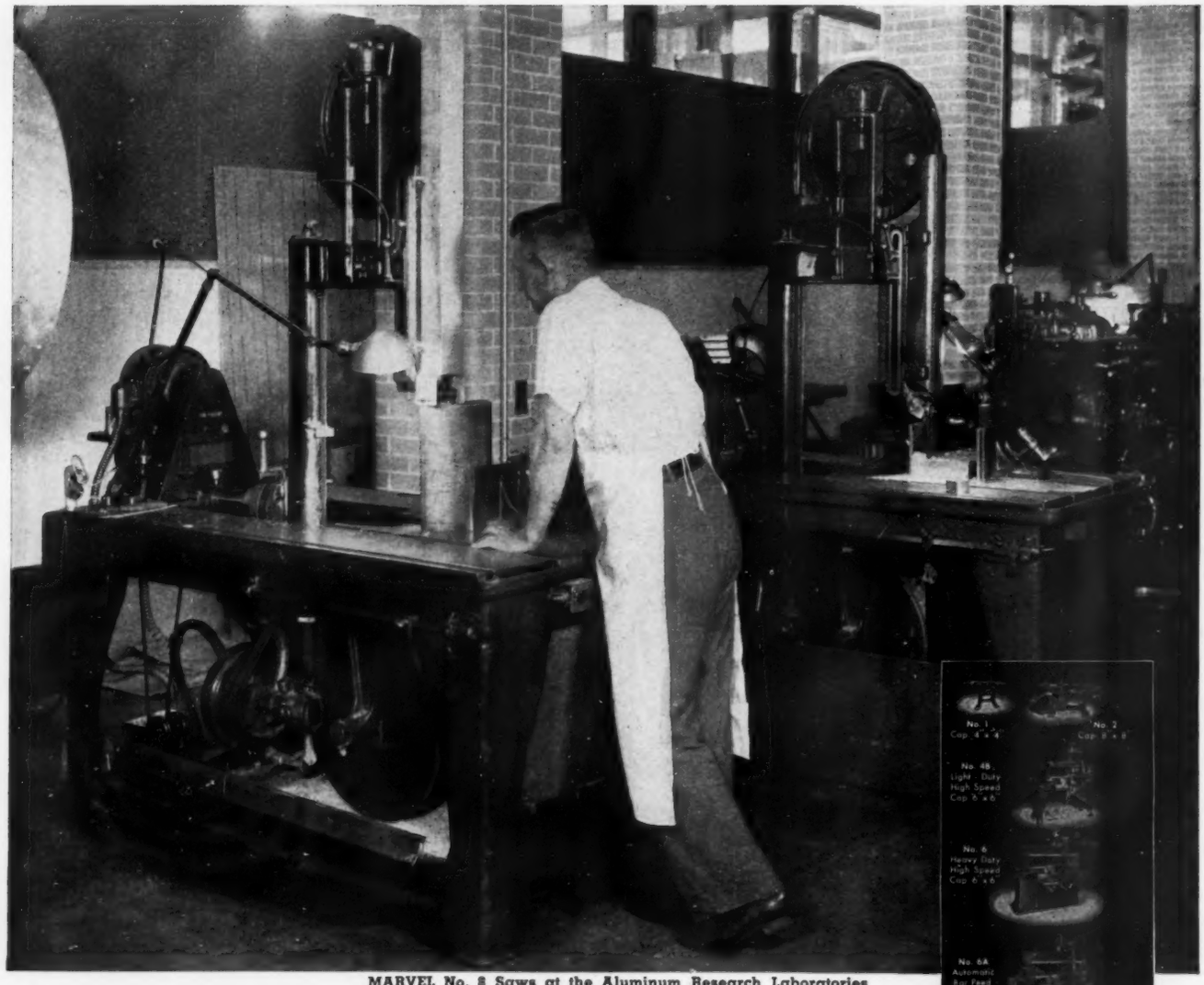
ORDNANCE•••—

ORDNANCE•••—
Rifle barrel Microhones for .303" bore have speeded and improved precision rifle making throughout the allied nations.



DIESEL•••—

The use of Microhoning is expanding rapidly. Let us send you literature on latest developments.



MARVEL No. 8 Saws at the Aluminum Research Laboratories at New Kensington, Pa.

MARVEL SAWS

Research Laboratories need Versatile Saws

The research laboratory of the Aluminum Company of America uses the two MARVEL No. 8 Metal-cutting Band Saws, pictured here, to cut test specimens from alloy steels and aluminum alloy products of every shape and description, varying from 1/16" to 18" thick. The MARVEL No. 8 in the foreground has been in continuous service for 11 years and proved so "well suited for the large variety of sizes and shapes to be sawed", that the modern MARVEL No. 8 behind it was added.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. **Chicago, U. S. A.**

Eastern Sales Office: **225 Lafayette St., New York**

Here's the Way to Do the Internal Grinding of TUNGSTEN STEEL Cartridge Dies

These NORTON DIAMOND WHEELS *are the Answer*

Rapid Production

Close Dimensional Accuracy

High Surface Finish

FOR ROUGHING—*Norton 100S-B100 Diamond Resinoid*

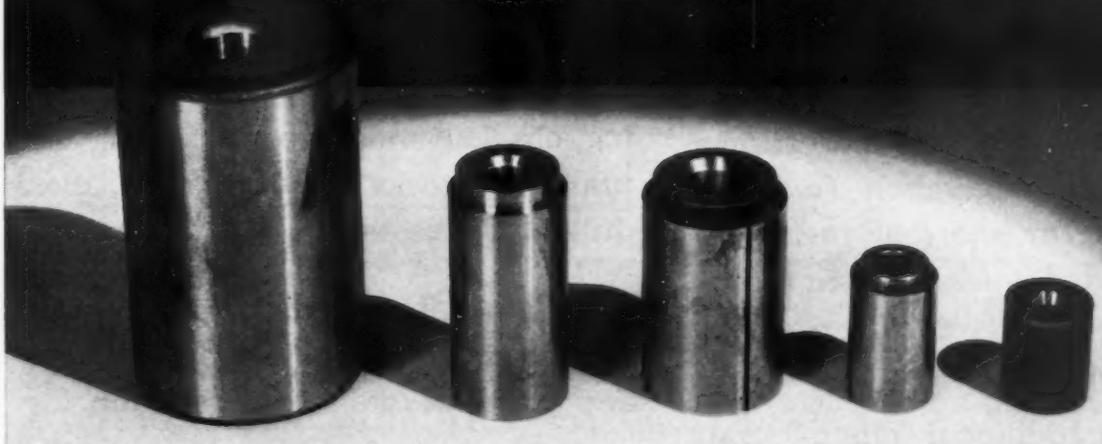
Grinds cartridge dies of dense, wear-resistant alloy steels such as tungsten at a rapid rate, many times faster than ordinary vitrified wheels. Wheel wear is so slight that hole size and straightness can be held to close tolerances without difficulty.

FOR FINISHING—*Norton 500-B50 Diamond Resinoid*

Produces a surface finish comparable to that obtained by lapping and in a fraction of the time.

If you are making tungsten steel cartridge dies it will pay you to consider Norton Diamond Wheels for the internal grinding job. Consult your Norton abrasive engineer.

NORTON COMPANY, WORCESTER, MASS.



NORTON ABRASIVES

An Emergency Statement

to Industrial Executives

Manufacturers—large and small—have a special opportunity to aid the war effort—over and beyond the contribution they are already making.

That opportunity is Salvage.

No matter how much scrap is dug out of the attics and basements of homes, the fence corners and gullies of farms, war production factories will still fall far short of the scrap material needed unless the manufacturers of America get 100 per cent behind the program.

Six million additional tons of scrap iron and steel alone, as well as vast quantities of rubber and other materials, are urgently required to bring our war program to full strength.

Whether you are a lace curtain manufacturer or a maker of drop forgings the obligation is the same.

The job is more than simply collecting scrap material around the plant, or turning in the scrap which is created on the premises. It is a job of condemning obsolete machinery, clearing out unusable stocks, obsolete tools, dies, drills, fixtures, etc.

All unusable material, equipment, and stocks should be scrapped at once and put back into war production.

The philosophy of "It may come in handy some day" must give way to the doctrine of "My country needs it now."

Patriotic volunteer committees of executives are already hard at work on this problem in 421 industrial centers.

The Industrial Section of the Conservation Division has a corps of technical advisers who are prepared to work with all types of industries.

A thoroughgoing Salvage program in a factory can not only help meet the present emergency, but can help prepare that factory for its postwar operations through the elimination of once wasteful practices.

1 The first thing to do is to put some one individual in charge of Salvage in all departments of your business and give him not only the responsibility to act, but the authority to act.

2 The next thing to do is to get in touch with your local Industrial Salvage Committee and map out a detailed program with the materials and ideas that are available. Their program contains 17 simple steps.

If in any doubt, write or wire at once to the Conservation Division, War Production Board, Railroad Retirement Building, Washington, D. C.

This job is being tackled by a democratic nation through the volunteer efforts and initiative of democratically managed industrial concerns, rather than through directives or compulsion as it is done in Axis countries.

Every executive, every superintendent, every foreman and every worker in every plant can help.

The main thing is to get started now.

All unusable material, equipment, and stocks should be scrapped at once and put back into war production. Please read this message and act **now.**

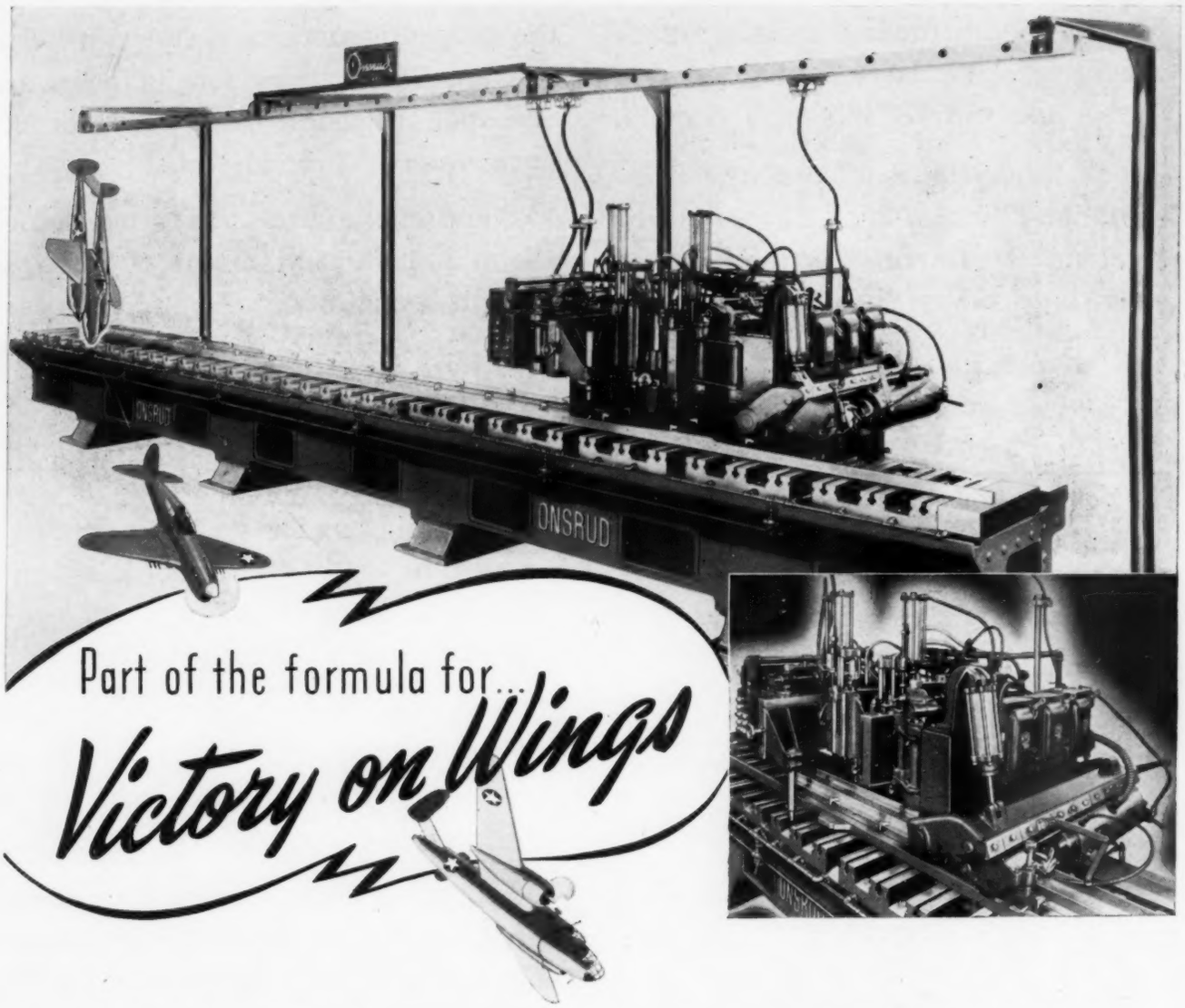
D. M. NELSON, CHAIRMAN, WAR PRODUCTION BOARD

This message approved by Conservation Division

WAR PRODUCTION BOARD

This advertisement paid for by the American Industries Salvage Committee (representing and with funds provided by a group of leading industrial concerns).

SCRAP FROM HOMES AND FARMS—As individuals, search your home from attic to basement. Search your garage. Look at the old familiar things in a new light. Do you need them—or can you get along without them? Your country needs every pound of scrap iron and steel, other metals, rubber, rags and burlap to provide the fighting materials our armed forces must have. Take your scrap to the nearest Salvage Depot—give it to a charity—or sell it to a Junk dealer. . . . If you live on a farm, consult your County War Board or your farm implement dealer. In any case, your scrap will flow back into the blood stream of our war production.



Part of the formula for...

Victory on Wings

Machine Tools + Men + Time = Planes was an easy production formula to write, but a hard one to follow. Planes had to come by the thousands, but machine tools were needed that never before had been built or designed.

One part of the aircraft production formula called for machining aluminum alloy extrusions up to 38′ long for wing spars and cap strips. Conventional milling machines could do the job but all too slowly. In one plant it took 90 hours' machine time to make these parts for each plane. When the Onsrud A-80 Spar Miller was put on the line, production time on these parts was reduced to 2½ hours, a saving of 87½ hours per plane. Here was a new type machine tool to deliver the accurate high speed production essential to a Victory on Wings.

On this new kind of milling machine, an extrusion is loaded on the bed and held in a fixture by air clamps. The carriage housing the cutters, rides on the bed. Former bars guide the one horizontal and two vertical cutters to produce the desired shape; tolerances closer than normally required in aircraft production are easily held. The 30′ bed of the Spar Miller illustrated permits a machining area of 12″ wide by 20′ long. Beds are assembled in 15′ sections, and greater machining length for longer extrusions may be had merely by adding one or more bed sections as required.

Spar Miller Applications

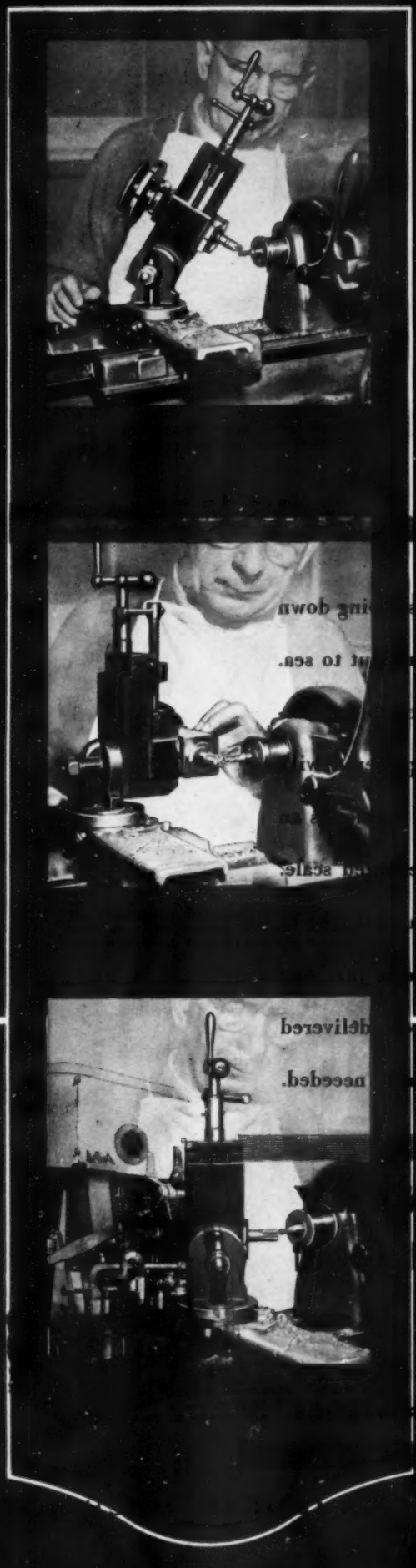
Application of the Spar Miller is not confined to the production of wing spars and cap strips. Experience is proving the value of this machine tool for a variety of milling operations on nonferrous metal alloys and similar materials in extrusion, billet, or plate form too big for conventional milling machines. Side cut-out milling, tapering and constant and varying beveling are three types of work easily performed.

Your inquiry regarding the A-80 Onsrud Spar Miller is invited.

ONSRUD MACHINE WORKS, INC.
3921 Palmer Street, Chicago, Illinois, U. S. A.
Sales Offices in all Principal Cities

Onsrud

AIR TURBINE and HIGH CYCLE TOOLS and MACHINES
ROUTING · DRILLING · SHAPING · GRINDING · MILLING



TRADE MARK

Thompson

REG. U.S. PAT. OFF.

Thompson

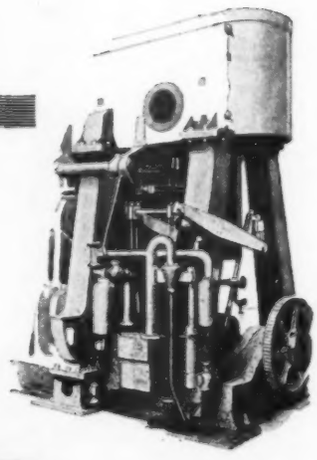
UNIVERSAL MILLING FIXTURE

for efficient toolroom or production use

THE LIBERTY SHIPS PUT OUT TO SEA

THE LIBERTY SHIPS of the Victory Fleet are slipping down the ways in ever increasing numbers and putting out to sea. They are carrying planes and guns and supplies to our far-flung battle bases. The majority of these are powered with Famous Hamilton Engines. The story of these engines is an epic of modern mass production on an unprecedented scale.

The Famous Hamilton Engine Shops played a vital part in the World War of 1917. Today's performance is just one more instance in which Hamilton Engines have been delivered in quantities, on time, when they were most sorely neeeded.



GENERAL MACHINERY

CORPORATION

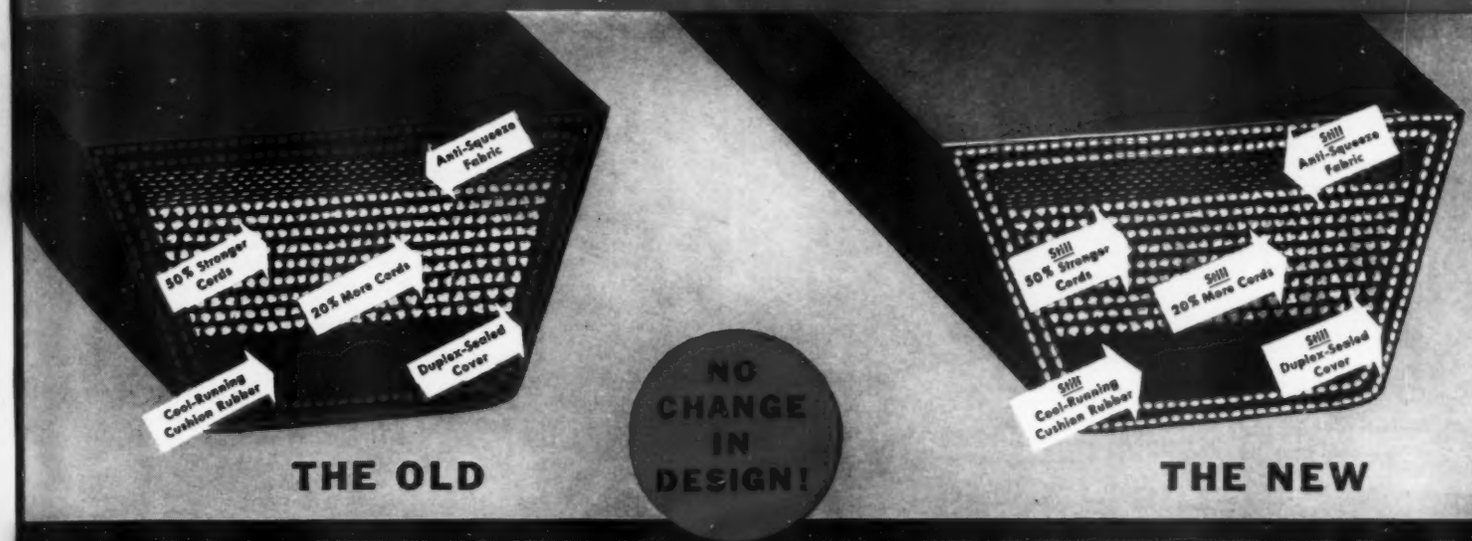
HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

More RED for the RED WHITE & BLUE



TEXROPE Goes to a war-time black!

YOU STILL GET . . .

1. The 50% stronger cords made possible by the sensational new Flexon process.
2. The 20% more cords that help give Texrope Super-7 V-Belts their extra "muscle".
3. The increased life provided by Texrope's shock-absorbing, cool-running rubber cushion.
4. The extra protection against grit, grease and dampness of the duplex-sealed cover. The *only* thing changed in cover design is the color!

NO ONE SAID we *had* to do it . . . but by sacrificing the red surface color identified with Texrope* Super-7 V-Belts, more rubber could be made available for Uncle Sam's new and special war-time needs.

So Allis-Chalmers did what *you* would have done . . . switched the famous "Red Belt" to a war-time black.

Will this color change affect you adversely? No. In each and every detail of quality-design, *Texrope V-Belts are unchanged!* They're still the same tough, smooth-working belts . . . that were literally *made to order* for today's new three-shift-a-day, round-the-clock operating schedules.

To step up the war-time efficiency of *your* power transmission, get the advice—and help—of your Texrope dealer or the Allis-Chalmers district office near you. Or write Allis-Chalmers, Milwaukee, Wisconsin. A-1517

*Trade mark registered U. S. Patent Office. Texrope Super-7 Belts are the result of the co-operative research and design genius of *two* great companies — Allis-Chalmers and B. F. Goodrich — and are sold exclusively by Allis-Chalmers.

Available in all sizes 1/2 hp to 2,000 hp

ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

WE WORK FOR VICTORY WE PLAN FOR PEACE

ACCURACY STEADINESS VERSATILITY

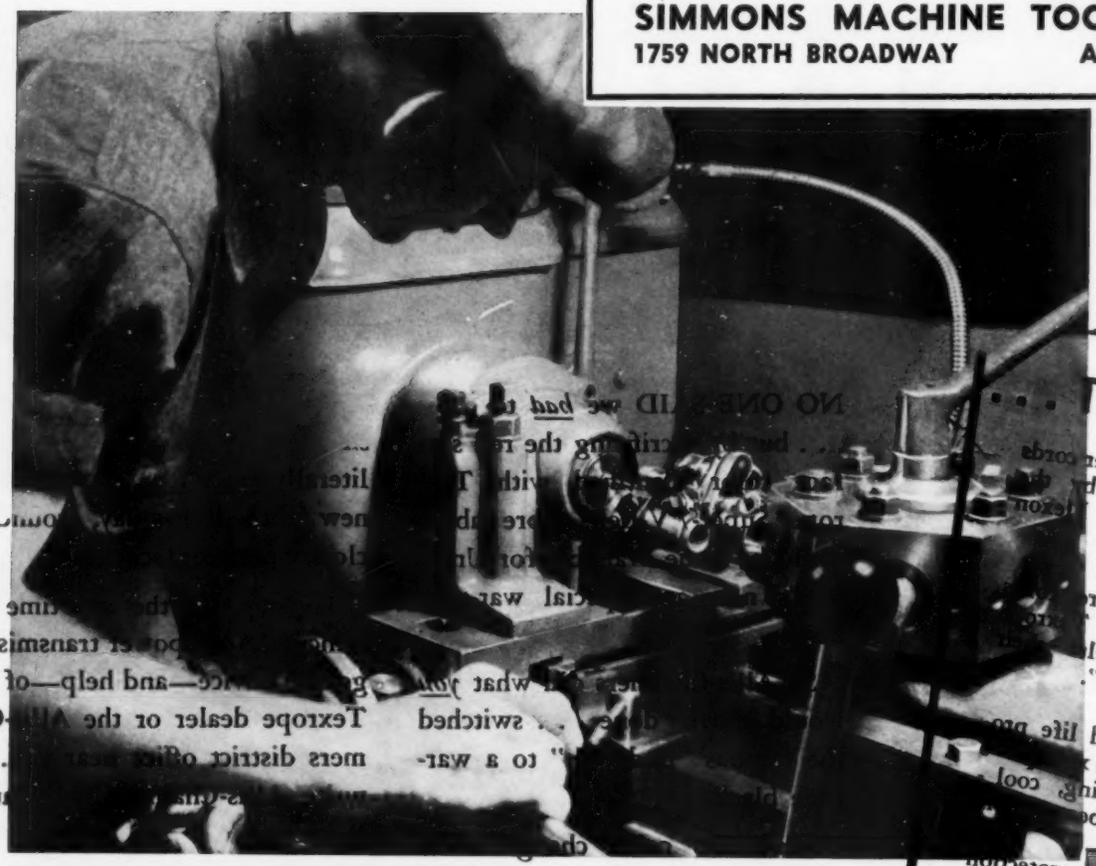
These Features of SIMMONS TURRET LATHES Are Speeding Production of Fighting Planes!

Simmons Micro-Speed Turret Lathes are the efficient, economical solution to the problem of producing large quantities of small aircraft parts. The photograph below, taken in a Curtiss-Wright Airplane Division plant, shows a close-up of a job on one of their Simmons Turret Lathes—a job which demands steadiness for accuracy in turning the small diameters.

In addition, Micro-Speed Drive and Selector Dial Control give Simmons Turret Lathes extra versatility, keeping them constantly on the job producing the wide variety of small precision parts essential to the victorious performance of American fighting planes.

Write for fully illustrated bulletin giving further details.

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY ALBANY, N. Y.



The No. 2 Turret Lathe shown above has a 1¼" Bar Capacity, 14" Swing. Available in plain and back-geared types with Timken Tapered Roller Bearings and Spindle Brake. Through Simmons Micro-Speed Drive and Selector Dial Control, 1000 different spindle speeds are available by the turn of a hand, when on the cutting.

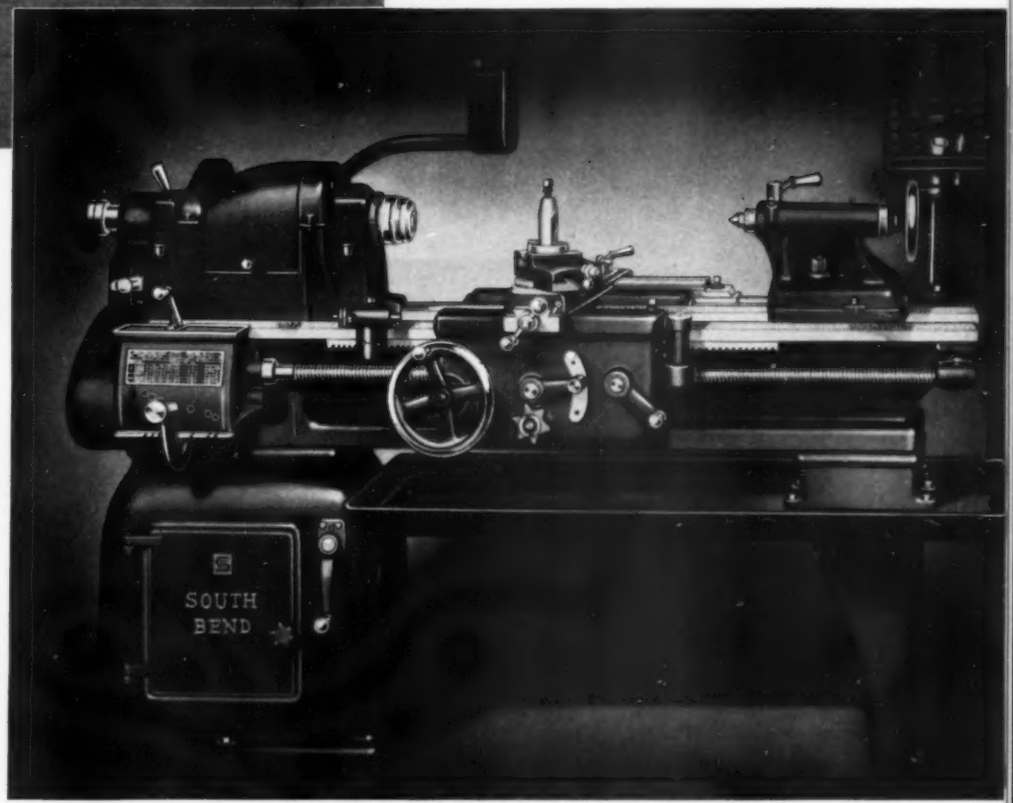
SIMMONS
MICRO-SPEED
REG. U.S. PAT. OFF.
LATHES · TURRET LATHES · MILLERS · BORING MACHINES

They Work Together *for* YOU

Yes, these two men are working together for you, a prospective user of South Bend Lathes. Together a shop foreman and a designer are finding the answer to one of the problems that must be solved to maintain South Bend standards of quality. Their friendly cooperation is typical of the shoulder to shoulder teamwork of our employees. This coordination of effort contributes much to the service and satisfaction you will receive from a South Bend Lathe.

All of us, here at South Bend, are working together for you—and for National Defense. Production schedules have been doubled and redoubled. But no sacrifice in quality has been made—nor will there be any lowering of our standards.

South Bend Lathes are made in five sizes: 9″, 10″, 13″, 14½″ and 16″ swing, Toolroom and Manufacturing types. Each size is available in several bed lengths. Complete line of practical attachments, chucks and tools.



SOUTH BEND 16″ TOOLROOM PRECISION LATHE

SOUTH BEND LATHE DEALERS

Atlanta, Ga. . . . . Chandler Machinery Co.
Baltimore, Md. . . Carey Mchy. & Supply Co.
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Toledo, Ohio. . . . . Reynolds Machinery Co.

SOUTH BEND LATHE WORKS

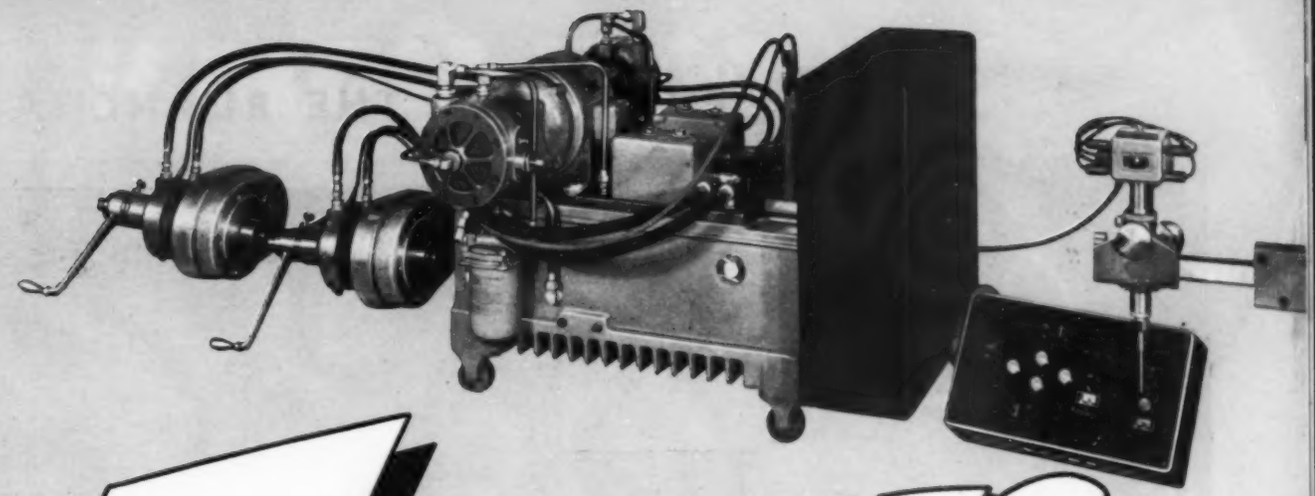
Lathe Builders For 35 Years

Dept 229 South Bend, Indiana, U. S. A.

TRADE MARK SOUTH BEND ENGINE LATHES

LET'S GO! U.S.A. KEEP 'EM FLYING

TRADE MARK
FEDERAL
1308
MADE IN U.S.A.
QUALITY
FEDERAL
BEARINGS
THE FEDERAL BEARINGS CO., INC.
Makers of Fine Ball Bearings
POUGHKEEPSIE, N. Y.
Detroit Office: 2640 Book Tower • Cleveland Office: 402 Swetland Building
Chicago Office: 902 S. Wabash Ave. • Los Angeles Office: 5410 Wilshire Blvd.



7 TIMES MORE PRODUCTION

from the Machines You're Now Using

DUPLIMATICS—the automatic control for standard machine tools—have established an average increase in production of 7 times the speeds possible with manually controlled machines alone. Accuracies demanded have been easily met; hand finishing has been cut; scrapped parts reduced on *all* kinds of Ordnance work—

TORPEDOES • BOMBS • MACHINE GUNS • AIRPLANE ENGINE PARTS
TANK TURRETS • ANTI-AIRCRAFT GUNS • AIRPLANE LANDING WHEELS

DUPLIMATICS ARE IN THE LARGEST MASS production plants in America, yet their cost is within the reach of smaller production shops.

You use a DUPLIMATIC with your present equipment. It is moved alongside any bottleneck machine—engine or turret lathe, shaper, boring mill, vertical mill—and connected up within the space of one day. The following day the operator of that same machine should increase production by 7 times.

(This is the average; we can give you an estimate when you tell us what the work is.)

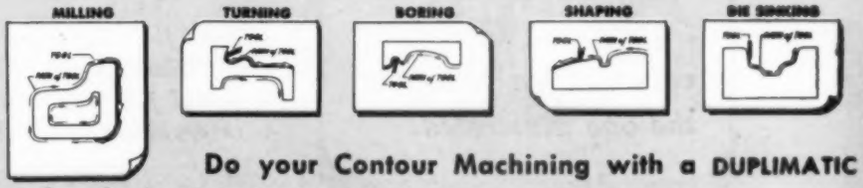
AIRCRAFT ENGINE GEARS

32 Gears instead of 4 in 16 man hours! That's the increase with DUPLIMATICS in one plant. Smoother finish, less hand finishing and no scrapped work on this tricky contour turning job. Standard engine lathes—with DUPLIMATICS—are now doing the impossible.

AIRCRAFT ENGINE CONNECTING RODS

Automatic contour milling of airplane engine connecting rod cavities. High speeds and increased accuracies possible with DUPLIMATICS have reduced hand finishing. Specially skilled operators are not needed.

These sketches indicate some of the automatic contouring that can be done on *standard* machine tools with DUPLIMATICS.

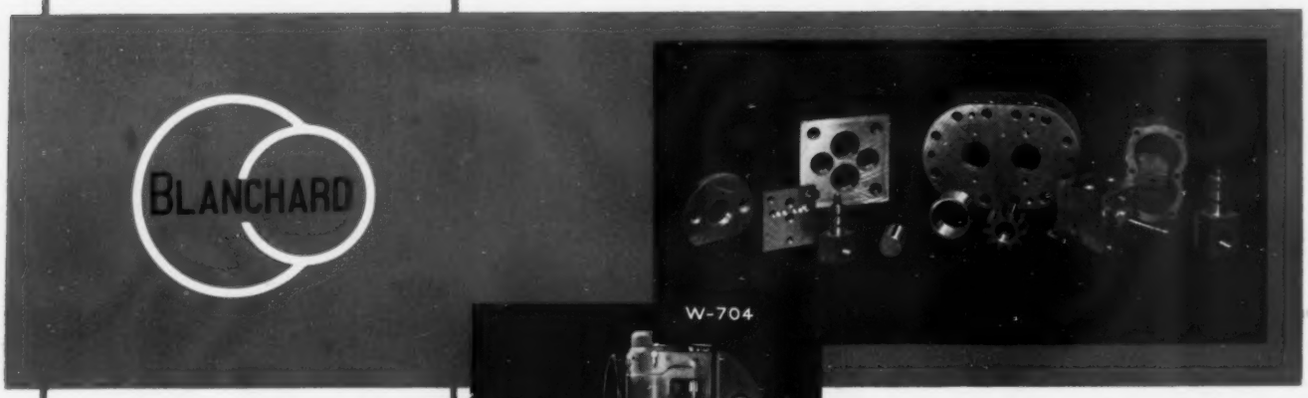


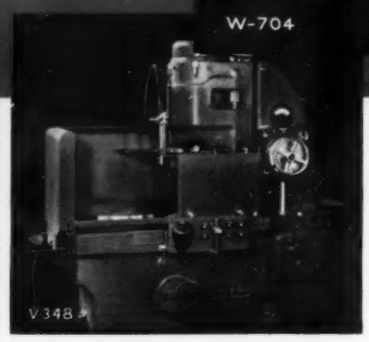
Do your Contour Machining with a DUPLIMATIC and make it AUTOMATIC.

DETROIT UNIVERSAL DUPLICATOR CO.

212 St. Aubin Ave. • Detroit, Mich.

"PUT IT ON THE BLANCHARD"





Easy assembly after grinding is another profitable feature of the Blanchard No. 18.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ **Production**
- ★ **Adaptability**
- **Fixture Saving**
- ★ **Operation Saving**
- **Material Saving**
- ★ **Fine Finish**
- ★ **Flatness**
- ★ **Close Limits**

★ . . . . . ***Especially valuable on jobs like the one illustrated.***

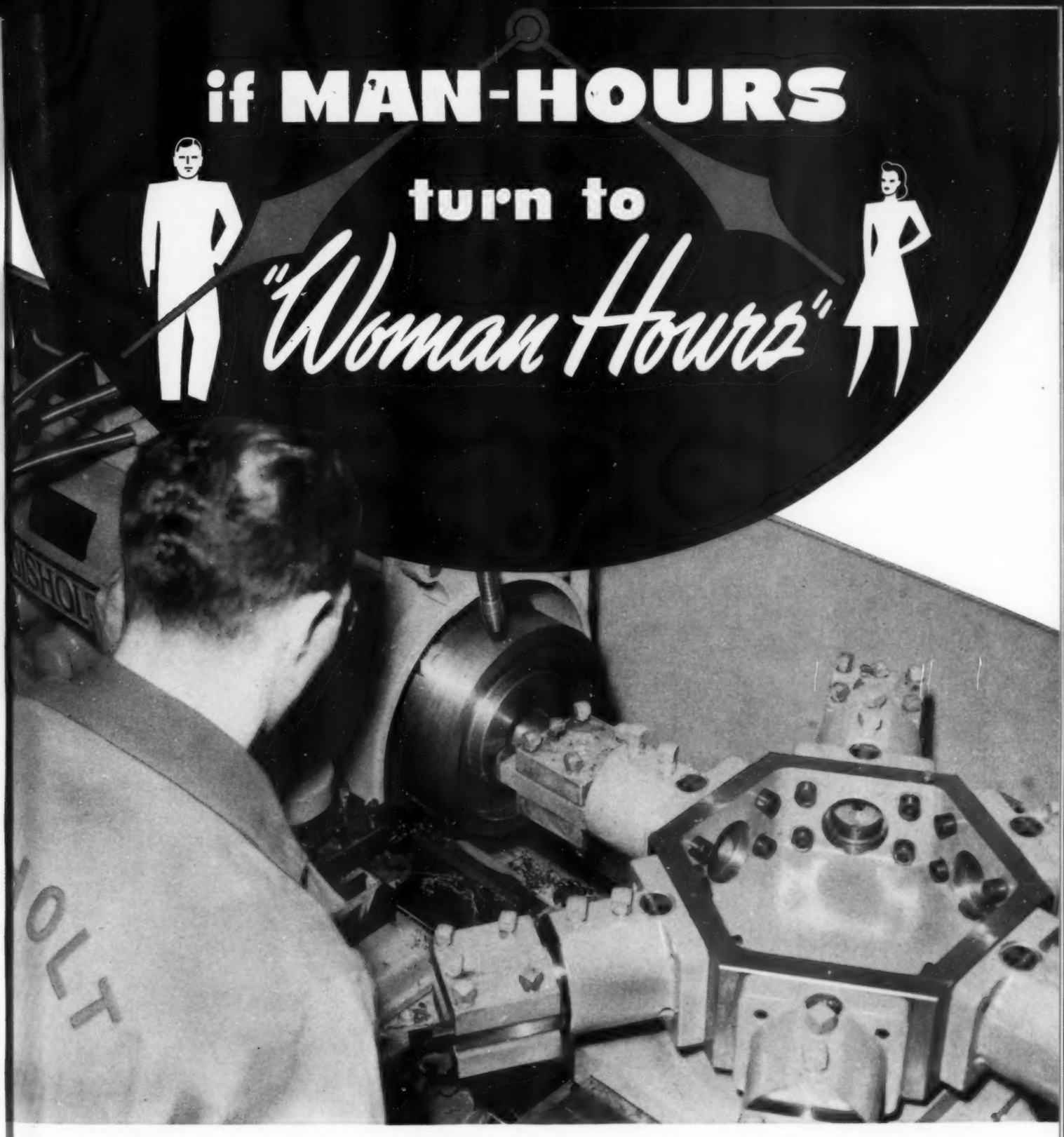
Blanchard Grinding cuts assembly cost. The speed with which parts can be assembled is a direct reflection of machining operations. All the flat surfaces on the pump parts, shown above, were ground on a Blanchard No. 18 Surface Grinder. This manufacturer is keeping his assembly cost low because the surfaces are flat and parallel and the finish is excellent. The accuracy needed for tight joints and correct alignment is maintained without sacrificing production.

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

if MAN-HOURS turn to "Woman Hours"



Teaching women the war-time jobs of relieving men at machine tools may come sooner than we think.

When it does, we can be grateful to our engineers and designers for the constant improvements which have led to simpler, easier operation, and have lessened the demands for physical strength.

GISHOLT

GISHOLT MACHINE COMPANY

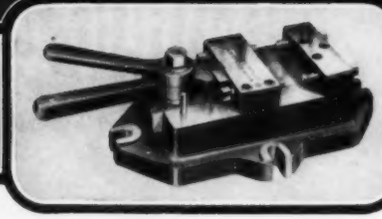
1201 East Washington Avenue • Madison, Wisconsin

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT IMPROVEMENTS IN METAL TURNING

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

TOOLS AND MACHINES FOR VICTORY

Right now we're all out for Victory in every Department of the Fenn plant. Day and night our force of skilled machinists, tool makers, and other experts are on the job producing machines and parts needed for our fighting men. Ours is a busy shop and will be for a long time to come. But when the tide turns and we are once more free to engage in peace time work, think of the name Fenn as a dependable source for special machinery, tools, parts and that expert knowledge demanded for precision work.



The Fenn Manufacturing Co.

HARTFORD, CONNECTICUT - - ESTABLISHED 1900

HERE'S a picture to gladden the heart of Mr. Donald Nelson, Chairman of W.P.B. For it shows one man doing the work of eight! His crew—seven working spindles and one loading station of a Bullard Mult-Au-Matic.

Thousands upon thousands of these valuable tools are multiplying time-power and machine-power in our giant national production push.

For firms producing planes, tanks, guns and motor vehicles, Mult-Au-Matics mean easier changeover and easier tooling. Daily they prove their greater speed and accuracy, their unmatched versatility. Every spindle will turn, face, neck, chamfer, bore, ream, drill or thread.

That's production as it's needed today. And Bullard is operating on 24-hour schedules to produce *more* Mult-Au-Matics — and then more.

THE BULLARD COMPANY
Bridgeport - - - - - Connecticut

THE BULLARD COMPANY
BRIDGEPORT, CONNECTICUT

SKILSAW TOOLS

HELP WAR-BUSY HANDS GET MORE DONÉ *faster!*

●America wants more speed in production . . . and *fast* SKILSAW TOOLS give every hand more productive power. America wants fewer work interruptions . . . and *dependable* SKILSAW TOOLS keep every hand on the job. It's no accident that SKILSAW TOOLS are at the front in the battle of production—America's busiest war-work plants use them to cut days from schedules, to pack more vital work into every hour that brings us closer to Victory!

If you have problems of production speed (and who hasn't?) ask your distributor to show you, in your own plant, on your own work, how SKILSAW TOOLS can help you.

SKILSAW, INC.
5059 Elston Avenue, Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Seattle • Toronto, Canada

ABOUT DELIVERIES

Your distributor can deliver most SKILSAW TOOLS from stock or ship promptly from factory . . . for all war-production needs

• **SKILSAW DRILLS**—23 Models. For fastest production drilling. Capacities from ¼ in. to ⅞ in. in steel.

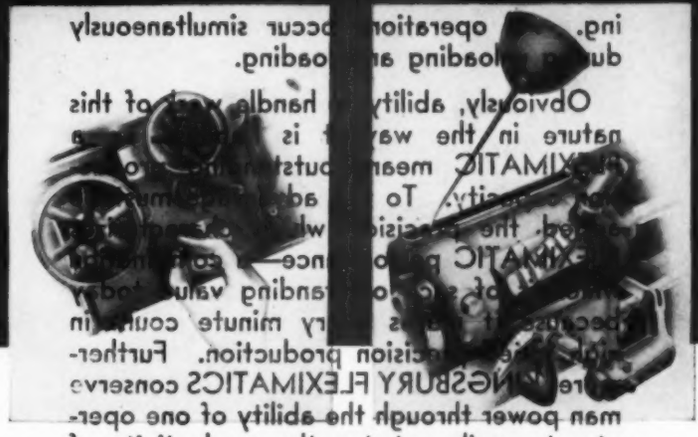
• **SKILSAW DISC SANDERS**—6 Models. Grind, file, sand and polish on all flat or curved surfaces.

• **SKILSAWS**—9 Models. Cut metals, wood and compositions in production and war plant construction.

SKILSAW PORTABLE ELECTRIC TOOLS

★ *MAKE AMERICA'S HANDS MORE PRODUCTIVE* ★

I'm Tellin' You...



Head Stock — Don't let oil level get below one inch from top

Tailstock — This top unscrews. Keep the felt filtering pad

Apron — Keep SAE 30 oil at a *Feed Box* — Keep the felt level where it can be seen at filtering pad in the trough

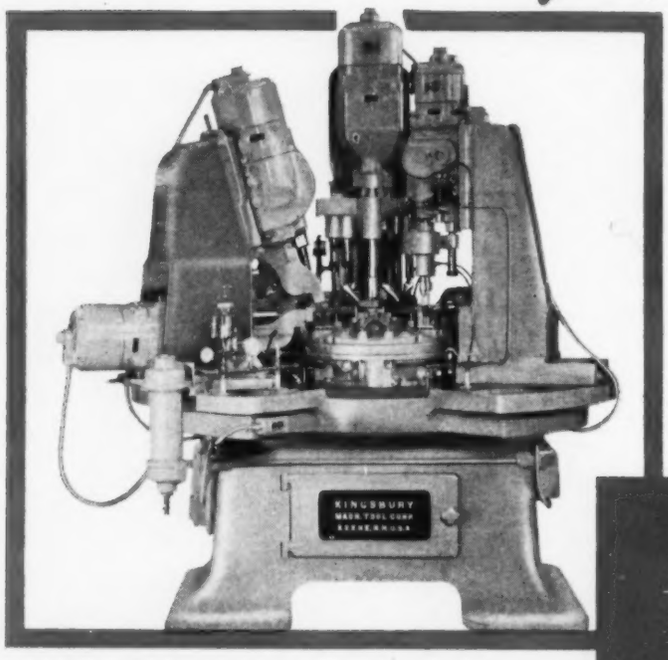
KINGSBURY MACHINE TOOL CORPORATION

Cincinnati, Ohio

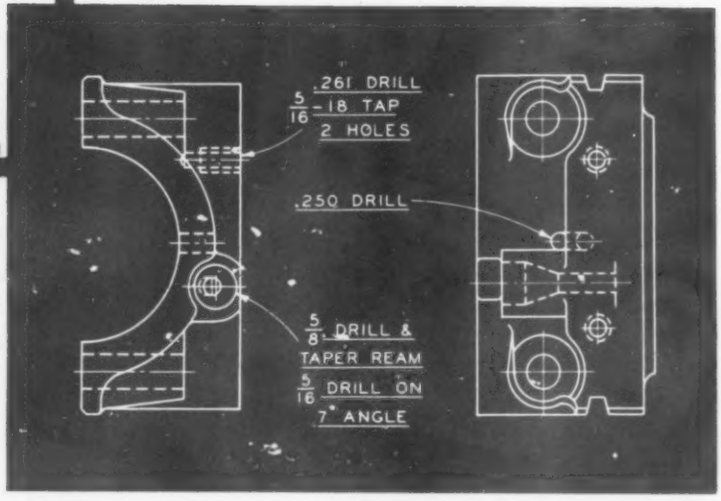
AMERICAN MACHINIST

largest Manufacturer of a Complete Line of Lathes

FLEXIMATIC
by KINGSBURY



Three operations from three different directions handled in a single chucking of the work . . . . . .



The advantage of the KINGSBURY FLEXIMATIC method for performing various machining operations in a single chucking of the work is exemplified here. The parts involved are automobile rear main bearing caps which are drilled, reamed and tapped on a Model GD FLEXIMATIC from three different directions without rechucking. All operations occur simultaneously during unloading and loading.

Obviously, ability to handle work of this nature in the way it is handled on a FLEXIMATIC means outstanding production capacity. To this advantage must be added the precision which characterizes FLEXIMATIC performance—a combination which is of such outstanding value today because it makes every minute count in high speed precision production. Furthermore, KINGSBURY FLEXIMATICS conserve man power through the ability of one operator to easily out-step the productivity of several men on general purpose machines.

Basically, the FLEXIMATIC is an automatic indexing machine built up of a number of standard specific operation units in such a way that *all* operations can be performed in a single chucking of the work. By the Kingsbury-pioneered FLEXIMATIC method, unique, flexible and versatile machines are available not only for fast, accurate production but also for quick set-up and convenient change-over.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

The SUPER SERVICE Radial

A BATTERY OF EIGHT

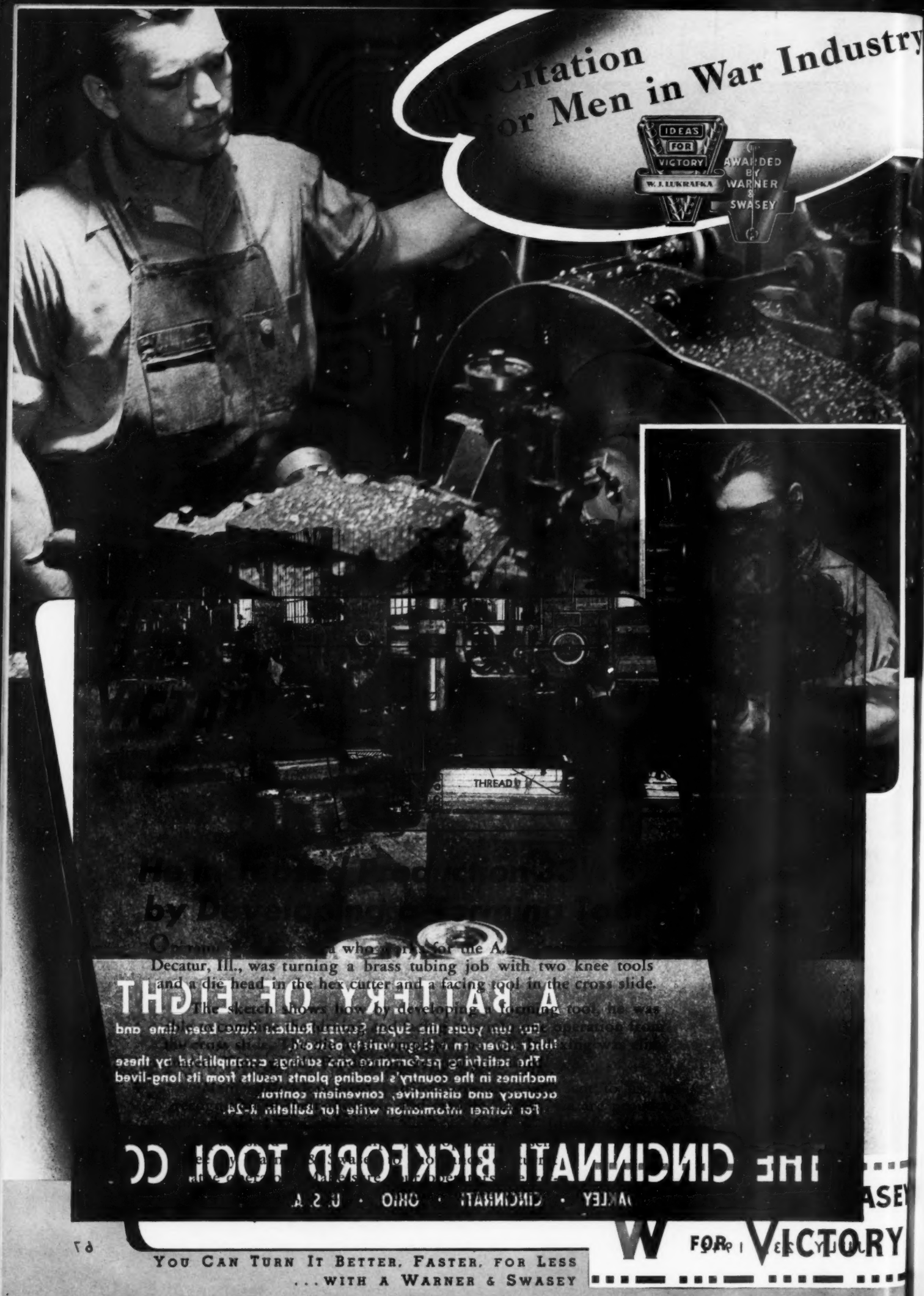
For ten years the Super Service Radials have been time and labor savers on a large variety of work.

The satisfying performance and savings accomplished by these machines in the country's leading plants results from its long-lived accuracy and distinctive, convenient control.

For further information write for Bulletin R-24.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.


Citation
or Men in War Industry
IDEAS FOR VICTORY
W. J. LUKRAFKA
AWARDED BY WARNER & SWASEY
THREAD
Decatur, Ill., was turning a brass tubing job with two knee tools
and a die head in the hex cutter and a facing tool in the cross slide.
A BATTERY OF EIGHT
THE CINCINNATI BICKFORD TOOL CO
YOU CAN TURN IT BETTER, FASTER, FOR LESS
...WITH A WARNER & SWASEY
FOR VICTORY

WHAT'S IN THIS ISSUE

CARL J. WIBERG and FRANK D. KENT

SCRAP FOR THE BIG SCRAP

Americans, normally a wasteful people, are learning the value of discarded materials. They are saving rubber, tin cans, old iron and even grease in a civilian effort to win the war. In large manufacturing plants the importance of scrap is multiplied by its volume. But there the job of salvaging becomes more complicated. Segregation of material is needed in order to make full use of scrap metal. This job is being done effectively by a V-plan now used by the Wright Aeronautical Corporation. It is described by Carl J. Wiberg and Frank D. Kent of that company. Page 761.

PLANE SHOP SHOTS

We learn from Texas that an instrument is used in that section of the country for prodding rabbits out of hollow logs and other holes of refuge. What this has to do with aircraft production seems a little obscure until you see the "rabbit twister" principal applied to stacking nuts prior to Magafluxing them. This brain child from the Lone Star State is just one of a series of ideas shown on a picture spread of "Shop Shots." Page 770.

EQUALIZERS

In many work-holding fixtures, it is advantageous to equalize the pressure used in clamping a part, or to equalize its position in order to keep the part in fixed relation to a center line. Many ingenious devices have been employed for this purpose. Some favorite methods are shown by John G. Jergens, Cleveland Pneumatic Tool Company. The use of line drawings and captions proves an effective way of putting these ideas into print. Page 768.

MORE ABOUT TRANSLATION

Last issue started a new standard on translating threads. The standard is concluded in this issue. Because of the increased use of threads in mechanisms of many kinds, the standard is timely and should find wide application in industry. Page 795.

FUZES FOR THE FRONT

Automatic machines are used to good advantage by a company that is turning out fuze parts by the million. This concern is working on both British and American fuzes. The tooling which makes this high production possible is fully described for both designs in the Armament Section. Page 775.

WHEN TO USE TUBING

The use of tubing saves material, especially in the manufacture of parts having a large bore. Tubing costs more per pound, and as its wall thickness increases in size, a point is reached where its use is not economical. A convenient graph giving the weight to wall thickness ratio helps to determine the dividing line. Page 767.

MAINTAINING CONTROL

We are not talking here about directive control which is a management problem, but about electrical control which is essential to keep the wheels turning. This type of equipment is a specialty which not all maintenance men fully understand. E. H. Alexander, industrial control division, General Electric Company, gives some helpful pointers on the subject. Page 764.

E. H. ALEXANDER

EASY ON THE EYES

Cleaning dirt and chips out of blind holes is speeded by the use of an air nozzle. The trouble is that the chips may be blown from the hole into the workman's eye. A simple shield attached to the nozzle avoids this danger. The chip deflector is just one of many workable shop kinks found under "Ideas from Practical Men." Page 772.

FROM DOWN UNDER

L. H. Hartnett, Australian director of ordnance production, is now visiting this country. Interviewed by an *AM* editor, Mr. Hartnett told of some of the accomplishments of the Commonwealth's industry. A timely news story points out that the island continent is producing something besides rabbits and kangaroos. Page 798d.

COMING

Probably the aircraft industry's greatest contribution to the technique of metal-working has been its novel methods of fabricating sheet metal. The necessity for making dies for limited lots has resulted in the use of plastic and non-ferrous metals for such tools. Application of both these materials for forming dies has been described in these pages. Another development now used by several aircraft companies results in inexpensive dies for piercing and blanking while giving good production runs.

A lot is heard today about speed in the air, and no one will deny its military significance. Few people, however, know the name of the world's fastest fighting ship now in production. An article soon to appear will tell just what this ship is and how it is made.

Old machines have proved their value in war production. Many have been reconditioned to perform much needed service in turning out munitions of all kinds. The International Harvester Company has set up a special department in one of its plants for doing this work. An article now in preparation will describe it.

More MACHINES for *More* WEAPONS for *More* FRONTS!

Far beyond the most optimistic expectations of the experts, American manufacturers have exceeded production quotas for the fighting forces in the air, on the land and on the sea.

CINCINNATI

HYPRO PLANERS

In hundreds of plants manufacturing machine tools—guns—tanks and other war equipment, Cincinnati Planers are on the job 24 hours a day meeting and topping tough production schedules. They will be equally profitable in supplying civilian needs when peace comes.

Here is a battery of Cincinnati Planers in a mid-west machine tool plant turning out parts quickly, accurately and economically.

If it's a planer job—put it on a Cincinnati Hypro. Sizes from 36" to 120". Results will justify your judgment. Bulletin upon request.

THE CINCINNATI PLANER COMPANY

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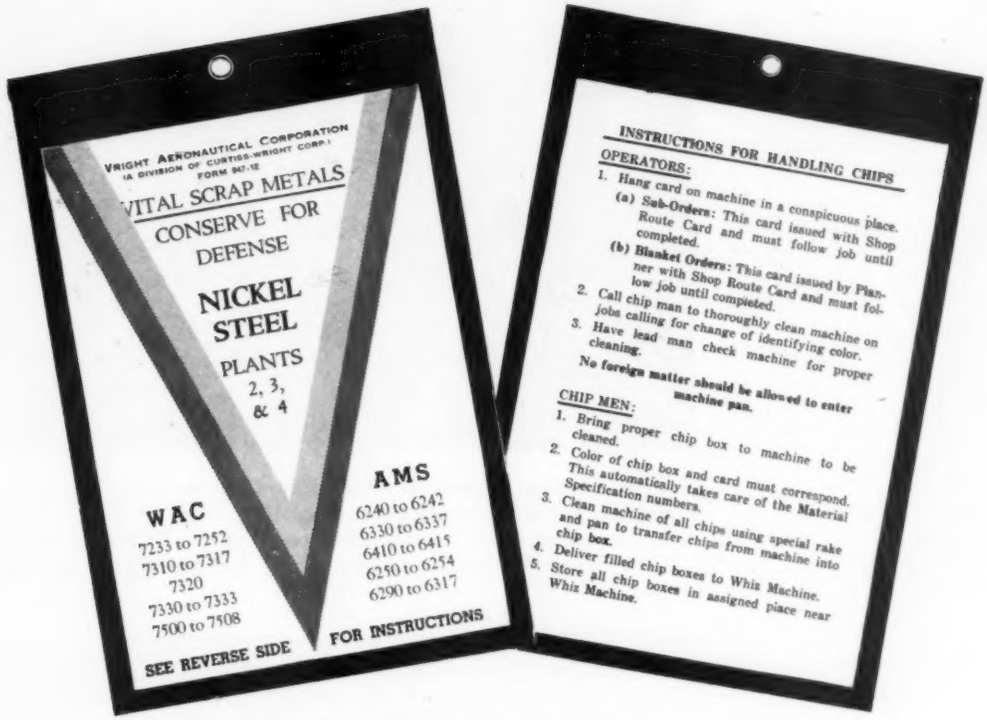

WRIGHT AERONAUTICAL CORPORATION
(A DIVISION OF CURTISS-WRIGHT CORP.)
FORM 947-12
VITAL SCRAP METALS
CONSERVE FOR DEFENSE
NICKEL STEEL PLANTS 2, 3, & 4
WAC
7233 to 7252
7310 to 7317
7320
7330 to 7333
7500 to 7508
AMS
6240 to 6242
6330 to 6337
6410 to 6415
6250 to 6254
6290 to 6317
SEE REVERSE SIDE
FOR INSTRUCTIONS
INSTRUCTIONS FOR HANDLING CHIPS
OPERATORS:
1. Hang card on machine in a conspicuous place.
(a) Sub-Orders: This card issued with Shop Route Card and must follow job until completed.
(b) Blanket Orders: This card issued by Planner with Shop Route Card and must follow job until completed.
2. Call chip man to thoroughly clean machine on jobs calling for change of identifying color.
3. Have lead man check machine for proper cleaning.
No foreign matter should be allowed to enter machine pan.
CHIP MEN:
1. Bring proper chip box to machine to be cleaned.
2. Color of chip box and card must correspond. This automatically takes care of the Material Specification numbers.
3. Clean machine of all chips using special rake and pan to transfer chips from machine into chip box.
4. Deliver filled chip boxes to Whiz Machine.
5. Store all chip boxes in assigned place near Whiz Machine.

Cards printed on one side with a large V in one or more colors constitute a code and form an identification system

V-Plan Saves Vital Metals

BY CARL J. WIBERG and FRANK D. KENT, WRIGHT AERONAUTICAL CORPORATION

"Don't mix unlike metals" is the keynote of a salvage system that really conserves material

WRIGHT'S SYSTEM for salvaging vital materials is simple to operate. It may be applied to any plant regardless of size. It starts with proper segregation of metals, so that maximum amounts of vital materials can be recovered.

In preparing this plan it was first determined which alloys could be grouped together for reclamation in common lots, and which should be held separate on account of high nickel or other valuable content. Special 4 x 6-in. cards were then printed, having on one side the instructions to the machine operators and chip men, and on the other a large V in one or more colors. These colors constitute a code which is followed throughout the plant, and form the key to the identification numbers.

For example, AMS 4630, 4632, 4635, and 4640 aluminum bronzes are designated with a yellow and black V, and on account of the similarity of their composition are grouped together. WAC specification numbers, used by the Wright company prior to the adoption of the A.M.S. (Aeronautical Material Specification) standards, are retained to avoid confusion when parts are manufactured from drawings on which the specification numbers have not been changed.

When a manufacturing order is issued to the shop, a card corresponding to the material to be used accompanies the shop routing card. From the moment the rough material leaves the stores, this card follows the job to completion. A transparent envelope is used

to protect the card; as soon as an operator starts a job, he hangs this envelope in a conspicuous place on his machine. When the operation is complete, he removes the card and forwards it with the material to the next machine.

In the event that the color of the card accompanying the next job is different, the operator is required to call a chip man and have the machine thoroughly cleaned before starting work on the new material. In a majority of cases a machine will work continuously on the same material, but when changes do occur there is no possibility of confusion. As an added precaution, the lead man is required to make certain that the machine has been cleaned before work is started on the new material.

At intervals throughout the day the chip men make their rounds of the various machines and collect non-ferrous chips in steel drums equipped with covers and painted with a wide V corresponding in color with the V on the cards. Under no circumstances may any material be placed in a drum which is not specifically designated for it.

A specially designed rake and pan are used for collecting the chips and transferring them to the drums, and a special carriage is employed for handling the drums in the shop. Solid scrap is segregated in similarly marked drums, but is held separate from the chips on account of its higher resale value. As the drums are filled, they are trucked to a central salvage yard where they are emptied into storage bins and then returned to their respective plants. The bins have a capacity of 100 drums and are marked with V's colored to match the cards and drums.

Cutting Oil Extracted

Stainless steel scrap is similarly handled in drums, but other steels are collected in large chip boxes and taken first to a centrifuge machine where all cutting oil is extracted and returned to the oil reclamation unit. The dry chips are then passed through chutes discharging into pits, from which the chips are raised by a clam shell bucket and crane, and loaded into dealers' trucks. Each plant has its own centrifuge and collection pits.

Ferrous metals are divided into two main groups, those containing less than two percent nickel and those containing more than two percent; further subdivision may readily be made, if desired, by simply adding a new color card and supplying additional bins and chip boxes.

It has not yet appeared worth while to install baling or briquetting equipment, both steel and red-metal chips are sold loose to approved dealers, as also

A material control card in a transparent envelope accompanies each manufacturing order throughout the shop. When the job reaches a machine, the operator hangs the card in a conspicuous place. When the operation is completed, the card is removed and forwarded with the material

The identification card hanging on the machine tells the chip man which scrap box is to be used when collecting the cuttings. When the material being cut is changed, the machine must be thoroughly cleaned out before the second job can be started

Finished parts which have been rejected by the inspection department are forwarded to a salvage crib where they are examined to determine whether they are still usable, despite the fact that the blueprint limits have been exceeded. The salvage committee includes representatives from all departments

Solid scrap, and stainless steel chips, are handled in drums which, when filled, are trucked to a central salvage yard and emptied into storage bins. The bins are marked with colored V's to match the cards and drums

Steel chips are collected in large boxes and taken to a centrifuge where all cutting oil is extracted and returned to an oil reclamation unit. Dry chips are dropped through chutes into pits prior to loading into purchasers' trucks

is the solid scrap. Aluminum and magnesium chips are sold direct to approved smelters, but solid aluminum and magnesium scrap, including that from both the machine shop and foundry, is remelted and fluxed in the company's own remelt furnaces and poured into ingots of a different shape from those of virgin metal for ready identification. If, as occasionally happens, there is an excessive amount of one particular type, this too is sold to the smelters.

Each heat of such metal is stored in a separate pile and is sampled by the metallurgical laboratory. If it is found to be within the specifications, it is released for production, together with new metal in proportions determined by the laboratory. If the remelt is found to be high or low in certain elements, written instructions are prepared showing exactly how much new and remelt metal is to be used and how much of the particular element added.

Committee Final Judge

Engine parts which have been rejected by the inspection department are forwarded to a special crib where they are examined by a salvage committee to determine whether they are still usable, despite the fact that the blueprint limits have been exceeded. Members of this committee include representatives from the engineering, production and inspection departments.

Parts rejected for undersize holes or similar remediable defects are returned directly by the inspection department to the shop for rework. Scrap from the salvage department is identified by its part number and the material specification number on the blueprint, and is placed in properly marked containers to be forwarded with other scrap of the same specification to the salvage yard for disposal.

While conservation of valuable metals takes first place in this program, it has also been extended to much other material, formerly discarded, which is now increasingly valuable. Waste paper, cardboard, burlap bags and rags are all sold to dealers; cutting oils and lubricating oils are treated in the company's own reclaiming plant. Steel drums, if in good condition, are returned to the original vendor, while damaged drums, formerly thrown away, are sold to companies which specialize in reconditioning them. Machines of all kinds, if still in usable condition, are sold to dealers for overhaul and resale; if damaged beyond repair, they are sold for their weight as cast iron scrap.

Large posters displayed throughout the shops caution operators against mixing scrap and against throwing refuse into the scrap containers.

Watch Your Control Equipment

BY E. H. ALEXANDER, INDUSTRIAL CONTROL DIVISION, GENERAL ELECTRIC COMPANY

Electric control equipment is an essential part of almost all modern production equipment. It should be inspected regularly

A FIRST CONSIDERATION in keeping control equipment in proper working condition is to prevent an accumulation of dirt, oil, grease or water on the operating parts. Where the air is saturated with moisture, or carries corrosive gases, it is well to inspect and paint the various control parts from two to four times a year, depending on the severity of the operating conditions. It is often desirable to add heaters or lamps within the controller inclosure to prevent condensation of excessive moisture. For best results, such heaters should be energized continuously, especially when the controller is not being used.

Circuit breakers or contactors are usually of very rugged construction. Still, it is best to operate them by hand from time to time and check to make sure that all of the clearances are normal and that parts are working freely. Should parts become worn so that adjustments cannot be maintained, new parts should be used. Adjustment and cleaning, as well as renewal of the tips, is necessary and depends on the frequency of operation of each device.

Occasional inspection should be made of all nuts and connection wires on panels and resistors, particularly when subject to vibration. Close inspection of pigtail connections should be made periodically since these are of finely woven wire for flexibility. In extremely corrosive atmospheres pigtail connections have been known to fall apart before there was any apparent indication of failure.

Troubles are bound to occur in the best of control equipment. Knowing what to do about them when they do occur will save much precious production time. If the fundamental cause of each trouble is understood the remedy will quite likely be apparent, and ways will be found to lessen the resultant trouble.

Renewal parts should be available at all times so that replacements can be made quickly. When production depends upon the continuous operation of each and every piece of equipment, delays necessitated by the lack of some inexpensive control part should not be tolerated

Temperature Rise

A contactor has several bolted or spring-closed contacts. Excessively high resistance at these contacts is the cause of the very high temperatures, such as 100 to 200 C., that may be reached when the contactor is carrying rated current or less. The most likely point of high resistance is at the contact where the movable tip makes contact with the stationary tip. However, high resistance may occur at any of the several bolted joints on the contactor. Therefore, if one of these devices begins to develop an excessive temperature, a millivoltmeter should be used to determine which of the several joints has a high-voltage drop across it.

When the copper contact or contacts that have excessive drop across them have been located, correction can be made by opening the contact and removing the oxide with a file (not with sandpaper or carborundum paper). It is unusual to find a high resistance in a bolted joint unless the contactor has previously reached very excessive temperatures. However, when excessive resistances are found in joints the cause should be removed.

Since high resistance will most commonly be found in the active contact, it is a very simple matter to inspect these tips weekly or monthly. If the temperature is unduly high, the tips should be given a few strokes with a file.

The foregoing comments apply particularly to copper contacts because they oxidize readily, and the copper oxide formed has a very high resistance. A file will remove the oxide and reduce the resistance to a low value again. Depending on various conditions, it may take a short or long time for the formation of sufficient oxide to cause excessive heating under ordinary types of service.

However, if sulphur gas is present, a high-resistance film will develop rapidly. To prevent this action, the contactor should be mounted in a tightly gasketed enclosing case, or immersed in oil.

Use of Silver Contacts

Sometimes it is not practicable to keep the resistance of contacts low by filing them. When it is desired or necessary to maintain a low resistance of the active contact without servicing, a silver face can be brazed to the two tips so that the contact is made through that metal. Silver will oxidize and the oxide has a higher resistance than the pure metal, but when heated, silver oxide has the unusual property of reverting back to the metallic form. Therefore, silver contacts are self-purifying.

Electrical interlocks may fail to make circuit because of oxidation where copper contacts are used. Sometimes such failure occurs because dirt gets between the contacts. By using one hemispherical and one flat tip made of silver, both of these troubles will be overcome. The point of the hemispherical tip will make contact without trapping dirt particles between it and the flat tip, and the use of silver will overcome the oxide trouble occasioned by oxidation when copper contacts are used.

Excessive wear on the contact tips of a contactor indicates that it is operated frequently. For conditions of this kind, silver should not be used for the contacts, because it does not have the ability to stand up under this severe service as well as copper.

Some maintenance men have the erroneous impression that contact tips that have been roughened by service should be kept smoothed up so that they will carry the load. A roughened tip will carry current just as well as a smooth tip.

Of course if a large projection should appear on a tip because of unusual arcing it should be removed. However, a tip that has been roughened by ordinary arcing need not be serviced. If a copper tip becomes overheated, this condition indicates that oxide has developed and should be removed.

A large percentage of contactor coil troubles can be traced back to heating. Therefore, if the temperature can be reduced coil troubles can be greatly decreased. Since the heating of a d.c. coil will vary as the square of the voltage, and the heating of an a.c. coil will vary about as the cube of the voltage, it follows that coils should be wound for the voltage that exists on the line. If the ambient temperature is high, this pre-

Oxide should be removed from copper contact tips by dressing with a file, not with sandpaper or carborundum paper. It is not necessary that contact tips be kept smooth; a roughened tip will carry current just as well as a smooth tip. Adjusting and cleaning tips is necessary at frequent intervals on most types of control equipment

caution becomes all the more important.

When an a.c. magnet, such as a solenoid, is supplied with constant-voltage excitation it requires a large inrush of current to close the armature. When the armature closes the coil current drops to a normal value. Sometimes armatures may not close because of excess friction or for some other reason and the large inrush current may burn out the coil within a few seconds.

Such mishaps can be prevented by the use of a thermal cutout to protect the coils. When the thermal cutout opens because the armature fails to close, it is merely necessary to replace a small link made of two pieces of metal held together by a low-melting-point solder.

Resistors are important auxiliaries and are encountered in many types, such as porcelain-tube, enameled resistors, open-wound, wire resistors, strip-wound and cast-grid. Some types are more likely to develop certain kinds of trouble than others.

Cast grids are usually assembled and held together by being clamped on a tie rod. The current passes from one grid unit to another across a ground face. When too much current, say several hundred amperes, is made to flow across these ground surfaces, they may develop high resistance and destroy the joint.

To overcome this difficulty, these joints should be cleaned and the current path paralleled. This procedure will reduce the current in the middle joints, where the trouble usually occurs or is most likely to develop.

Brazing for Better Contact

Edge-wound or strip resistors usually have their terminals either brazed or welded to the strip, which prevents excess resistance from developing at this joint. In order to provide an adjustable contact on this type of resistor, a clamp type of terminal is sometimes furnished. However, since the resistor may become quite hot at this point, a bad contact is very likely to develop. Therefore, if one does develop, the best cure is to braze the terminal at the proper position.

The high-resistance cast grids that have a small cross-sectional area sometimes give trouble because of breaking, especially if they are mounted on machines that vibrate severely. The best correction for this trouble is to use an edge-wound resistor, which is non-breakable. This type is made of corrosion-resisting material that is capable of withstanding very high temperatures without scaling.

Relays have been designed to operate as a function of time. The one that was designed first to operate on a time basis was the dashpot type. Movement of a solenoid is retarded by means of a dashpot, giving a time-current relation that is called an inverse-time characteristic.

The kind of trouble that is inherent in a dashpot was the primary reason for the development of the other types of timing relays. A dashpot is essentially a close-fitting device that is easily affected by dirt, gumming of the oil, and corrosion of the close-fitting parts. Also the torque of the magnets varies with the position of the solenoid armature in its coil.

If trouble is caused by tripping while starting a motor or shortly after getting up to speed, there are three things that can be done:

1. A heavier oil may be used if the relay almost holds.

2. A starting contactor can be used that does not include the overload relay in the circuit. After the motor is up to speed, the running contactor can close and the starting contactor can open, connecting the overload relay into the circuit. This is a rather complicated method, but it is sometimes used.

3. The final alternative is to replace the dashpot with a temperature type of overload relay. This is one of the reasons why the temperature-type overload relays were originally developed.

Since the function of a temperature overload relay is to protect a motor under all ambient temperatures, its final temperature should be the same as that of the motor—which is 90 C. This means that a motor can have a 50 C. rise in a 40 C. ambient.

Therefore, the relay should just trip if placed in a 90 C. ambient, or in a pail of water held at that temperature. If a relay does not function correctly, it should be immersed in a pail of water kept at 90 C. and adjusted so that it will. The adjustment should not be made by bending the thermoflex strip. If this method of checking or adjustment does not provide the necessary degree of protection to the motor, it can be assumed that the size of the relay heater is not correct.

A temperature overload relay does not need any such maintenance attention as outlined for dashpots, but its use does involve the observation of certain precautions. Since it is sensitive to temperature, it should not be put in a strong draft, such as that from a window or a circulating fan. If it is necessary to place it in such a position, it should be shielded by a cover.

Conversely, a temperature overload relay should not be located above a source of heat, such as steampipes. In brief, the relay should be in an ambient temperature that does not differ greatly from that of the motor.

The third type of relay is used for controlling the rate of acceleration of motors and for many other functions where a short time-delay is needed. In the escapement type of relay, a pendulum is used as the governing means, which makes it necessary to mount the relay in a definite position with respect to the motion of the pendulum.

It is not always possible, however, to mount the relay in the proper position, and when it is in the out-of-true position it is less dependable. Shortening the pendulum makes it possible to tip the relay further from the vertical, but the shorter pendulum results in a shorter time delay.

To overcome this limitation a new design that has a balanced pendulum has been made available. The variation in time is obtained by changing the length of the stroke. In principle the two devices are the same, but mechanically they are quite different.

If the old-type escapements fail to time properly, their mounting position should be checked. However, if the application is such that it is difficult to mount and keep the relay in the proper position, use of the balanced type should be considered.

The job of the maintenance man is easier if he has instruction books and wiring diagrams covering every control and every circuit for which he has responsibility. Extra coils and contact tips should be kept on hand as well as a complete list of spare parts. Maintenance is simplified considerably if the maintenance man makes a practice of becoming thoroughly familiar with the circuits and operation of each new controller as it is installed in the plant.

Copper-Silver Contracts

Copper increases the hardness of silver, and silver-copper alloys are among those most extensively used for electric contacts. Copper somewhat increases the film-forming tendencies, but where contacts act with sufficient wiping action the film is easily destroyed and the surfaces remain clean. Coin silver, which contains 10 percent of copper, is hard enough to possess high resistance to wear and is used where atmospheres are free from sulphur.

The electrical conductivity of coin silver can be increased from values around 70 percent to approximately 100 percent by appropriate heat-treatment. Other metals are alloyed with silver for use in contacts and the refractory metals are added in sintered mixtures to promote arc resistance.

Seamless Tube or Bar Stock?

Does seamless steel tubing or bar stock offer a lower total cost per piece? The merits of each case should be considered

MANY FACTORS INFLUENCE the economic choice between tubes and bar stock in the quantity production of machined parts. It is frequently said that if the weight of the proposed tube stock is 60 percent of the equivalent bar stock, the use of tubing will be the more economical but in many cases tube stock will cost less than bar stock even if the tube stock weighs considerably less than 60 percent of the bar stock.

The real question is: which type of stock will result in the lowest total cost of finished product?

$$T = S + M - (P - L)$$

If T = Total cost
S = Material cost per piece
M = Machining cost
P = Gross value of scrap
L = Cost of handling scrap

Total cost is least when the material cost per piece is lowest and machining cost is at a minimum, as the net value of scrap is always small with steel.

The significant consideration in material cost is the cost per piece, not the cost per pound. Bar stock does cost less per pound than tubing, but it often costs more per piece. When materials are scarce, it is especially important to conserve them.

The fact that seamless mechanical tubing is sold by the foot, and not by the pound, permits exact calculation of material cost since variations in size or weight are not reflected in the price.

With this in mind, the accompanying graph is significant as an indication of the savings in stock resulting from the use of tubes.

Tubing Now Free Cutting

There was a time when the scale on tubing and the lack of straightness made it harder to machine, but today tubing can be had free from scale and as straight as bar stock. The use of tubing makes it necessary to cut away less stock making machining easier. This means higher production per machine. Machining speeds can be higher, as drilling operations are slow on bar stock and these operations are eliminated if tubing is used. Both the work and the tools run cooler with tubing because the tools cut away less metal. The tools thus last longer and there is less down time for keeping them sharp. These are important factors, for they tend to keep the machine busy as well as enable it to run faster. The lighter cuts and higher speeds, especially for inside operations, favor the use of carbide tools with rapid cutting, superior finish and minimum time for sharpening and resetting.

Tooling May Be Simplified

In the case of multiple-spindle machines, such as the screw machine, the effect of using tubing rather than bar stock is to make extra positions available as the hole already in the tube does not have to be drilled. This is of special importance where, with bar stock, holes must be large or the material is of a type hard to machine, which might require expensive oil-hole drills. There are even cases, especially where the hole to be drilled is deep, in which a four-spindle machine using tube stock can do the same work as a six-spindle machine using bar stock. The extra positions for tools which, in effect, the tubular stock makes available, may save using a second machine. Lighter cuts certainly save wear on the machine as well as on tools. With tubing, it is easier to do a good job of annealing, making for easier machining, as heat does not have to penetrate through so great a thickness of metal.

The return in the sale of chips of steel is always small and may be offset if the cost of making chips, and of handling and selling them, is considered. There is, of course, a much larger bulk of chips when using bar stock, but the steel represented is paid for initially in the bar and seldom brings one third as much as scrap.

There are parts which require no machining in either the hole or on the outside of tube stock. In such cases, the piece is chucked in the hole and a light cut trues the outside diameter, or chucked on the outside and a light cut trues up the inside.

Machining factors favor the use of tubing, hence the question is usually whether the saving on machining will offset any extra cost for material, if the tubing costs more per piece than the bar stock, which sometimes it does not. The net credit for chips seldom affects the problem greatly when the material is steel. In the case of high-priced alloy steel, it often pays to use tube having holes smaller than 60 percent of the outside diameter, as the scrap from corresponding bar stock brings little if any more than carbon steel scrap and the loss in pounds of expensive metal turned into chips is high if bar stock is employed.

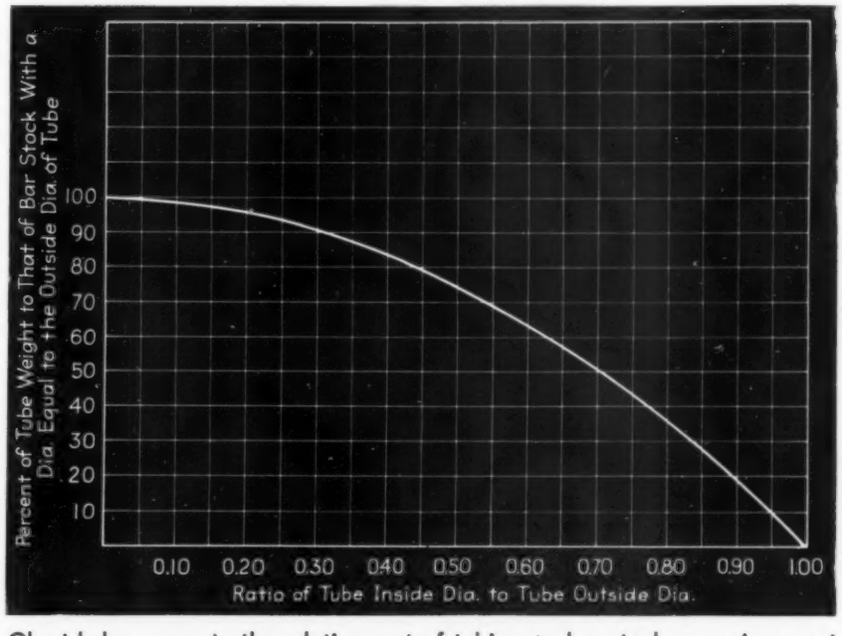


Chart helps compute the relative cost of tubing vs. bar stock on a given part

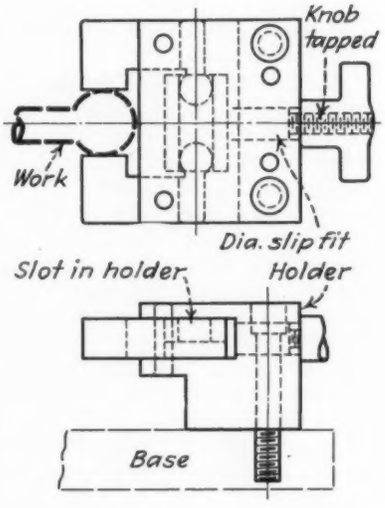
Jig and Fixture Details—II

BY JOHN G. JERGENS, CLEVELAND PNEUMATIC TOOL COMPANY

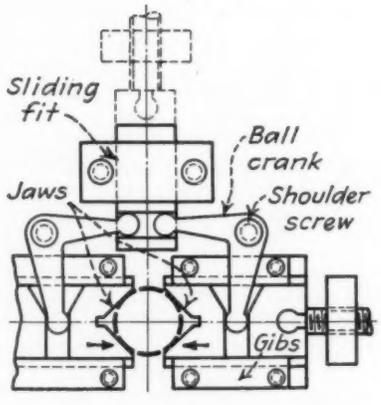
EQUALIZING DEVICES are frequently called for in fixture design. Whereas the ordinary vise has one fixed and one movable jaw, the equalizer has a combination of movable jaws which clamp the work in proper relation to the center line.

Variations of this basic type of equalizer use pins for internal work, V-slides for spherical work, or an inclined plane for raising the work horizontally. Whatever method is used, the equalizer serves the purpose of making allowance for slight variations in unfinished work and holding it in the proper position for machining.

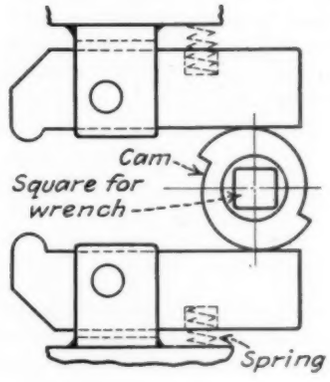
The thirteen examples shown here supplement those shown in the first group. Other details of jig and fixture design will be illustrated in subsequent articles of this series.



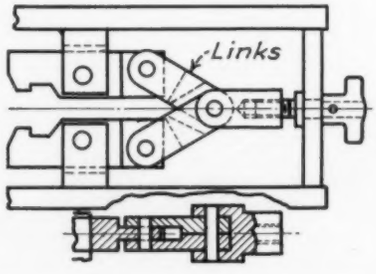
In this compact form of the ball crank equalizer, the crank arms have flat circular ends which fit in a slot in the knob-operated slide



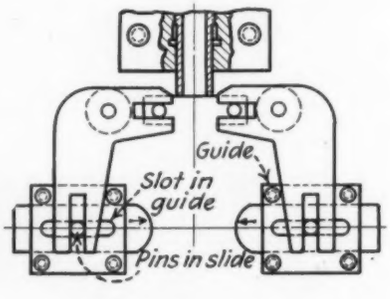
The jaws of this ball crank equalizer can be operated either by a screw arrangement mounted on one jaw, or by one attached to the slide, as shown by broken lines



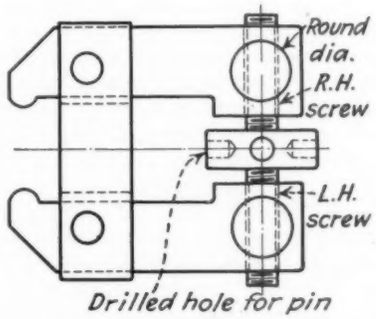
The jaws of this equalizer are closed by turning the cam with a wrench. Continued turning of the cam after the jaws have contacted the work produces a wedging action which locks the cam in place



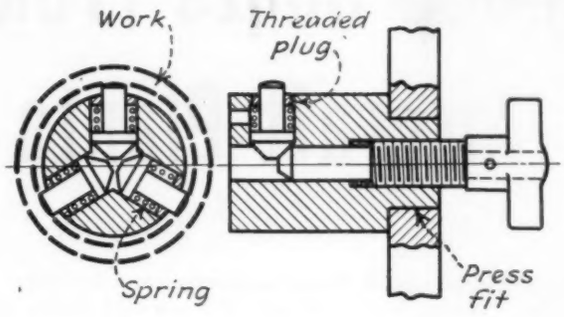
Turning the knob of this link equalizer counter-clockwise advances the link mounting, spreads the ends of the links, and closes the jaws upon the work with equal pressure



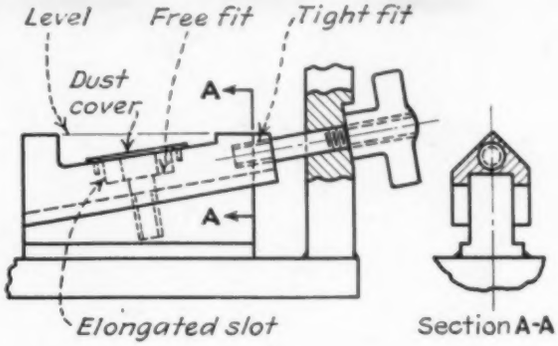
Pins are mounted in the sliding jaws of this equalizer and move through slots in the guides. The crank arms have slot ends which are fitted over the pins



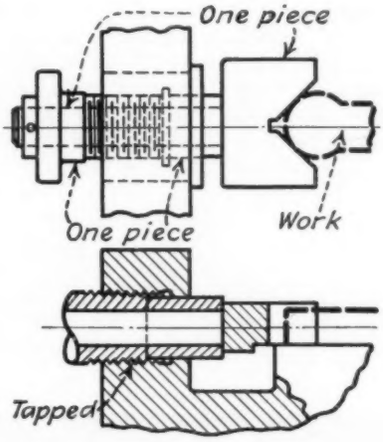
The screws in this fixture are equipped with right and left-hand threads. When they are turned by using a pin in the central collar, they open or close both jaws



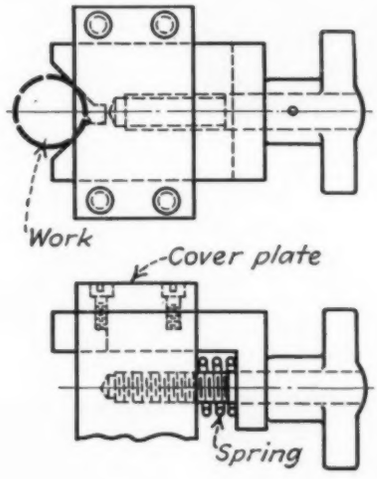
Internal work is held by three pins which are advanced equally by the tapered end of the threaded center pin. Springs withdraw the pins so that work may be removed



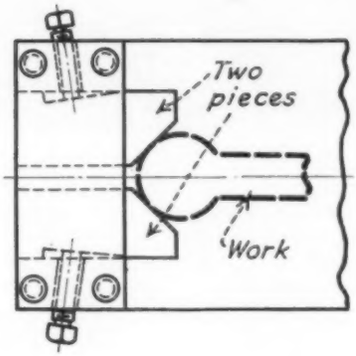
This parallel equalizer assures that the surface is kept level by raising it along an inclined plane. A bolt in the elongated slot permits travel but holds the cap in position



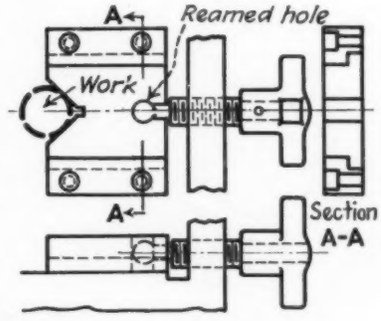
Only two basic parts are required for this equalizer. The V-clamp is part of the rod which fits in the threaded knob. The rod is held in place by a washer and cotter pin



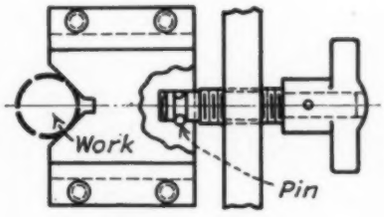
In this simple form of the V-type equalizer for holding round or spherical work, tightening the knob advances the slide and loosening the knob permits the spring to withdraw the slide



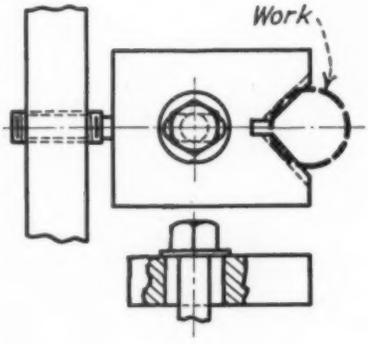
The two faces of the V in this equalizer are separately adjustable. This arrangement is suitable where delicate adjustment is required and work can be changed without disturbing the setting



An upright part of the fixture base is drilled and tapped to accommodate the screw which operates the V-slide of this equalizer



The screw is attached to the slide of this equalizer by forcing a pin through the slide at assembly. This pin is a press fit against a recess which is in the screw



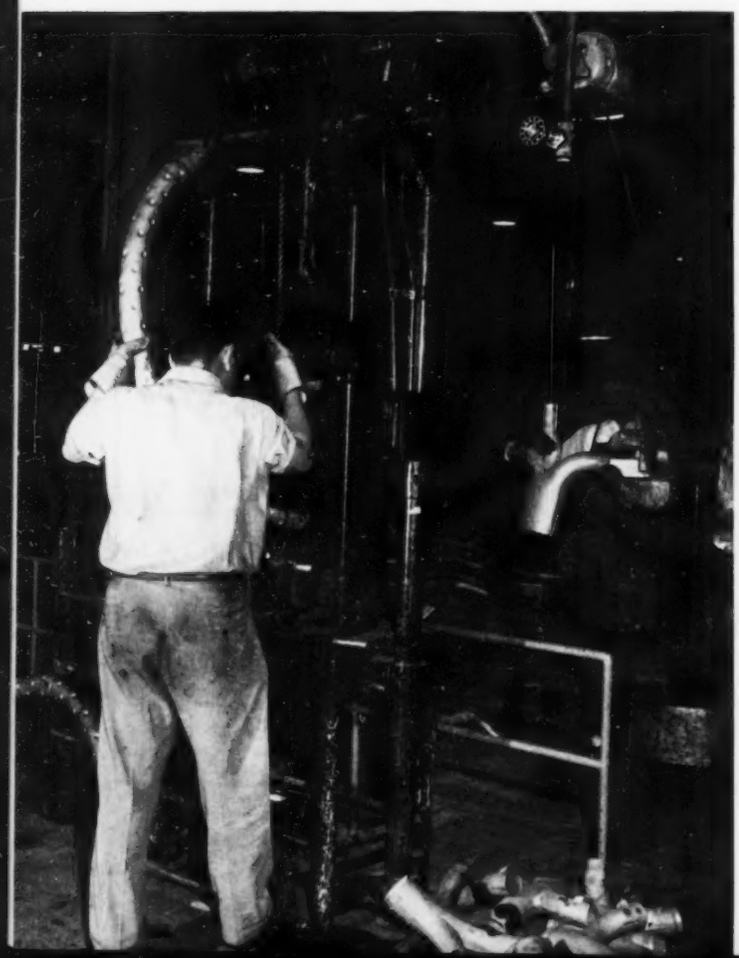
Another stationary type of equalizer, this V-slide has a limited amount of travel to permit initial adjustments of the equalizer

Shop Shots From Aircraft Plants

Small, high-speed shears, operating at 120 strokes per minute, relieve larger 12- and 16-ft. capacity shears when blanking small shapes from stock sheets of duralumin. These small shears operate at two to three times the speed of the larger shears, save valuable floor space, and give increased speed in the manufacture of small parts. Lockheed Aircraft Corporation.

Hands and feet combine to save welding time in this 1942 model of the potter's wheel. In welding a large number of small aircraft parts, it is necessary for the operator to turn the parts while he is working. If he must use his hands for this purpose, the welding bead is interrupted and valuable time is lost. The device shown consists of a flat circular table supported on a vertical shaft which is mounted in a frame fabricated from structural shapes. At the lower end of the shaft, a similar disk is located for convenient rotation by the operator's feet. Any suitable work-holding device can be supported on the upper table. After a short period of practice, welders become extraordinarily adept at coordinated hand and foot work to bring the fixture and torch in proper relation as the job progresses. Lockheed Aircraft Corporation.

Swaging operations for small production runs or for experimental work are handled in a miniature rope drop hammer developed by the company's engineers. Manifold parts, manufactured by this concern, are sized, or "bumped" after forming, in this machine. For production runs on similar work, the company uses pneumatic and mechanically operated tools. Ryan Aeronautical Corporation.



A "rabbit twister" for loading nuts on rods for Magnaflux inspection is one of the production shortcuts developed in a new Texas plant. Formerly, Magnaflux operators picked up nuts by hand and "strung" them on the rods. Then, Supervisor Bill Johns thought of the "rabbit twister": a strong wire with one end bent into a loop and the other formed into a handle. The operator now turns the loop end in a bin of nuts to pick them up for transfer to the rods. North American Aviation.

Shop workers are required to report with a specified minimum of hand tools in accordance with their trade classification. Because of the difficulty in securing machinists' tools in local stores, many aircraft manufacturing plants are operating their own stores for the convenience of their employees. Before the store operated by North American Aviation was started, workers who had been hired frequently came to work saying they had combed their neighborhood for tools and could fill only a fraction of their needs. Since tools are essential to the job, the lack of them mean lost time in putting new employees to work. The company store avoids this difficulty. It is operated on a cash basis and sells tools at cost, without any charge for overhead. North American Aviation.

Overhead pipes carry gas, air, oxygen and acetylene in a manifold welding department. They are distinguished by being painted white, yellow, green and red, respectively. Oxygen and acetylene are used for the welding operations. Gas is for preheating or heating for straightening. Air is the cooling agent, and with the addition of a syphon and a bucket of water may be used as a water spray for rapid cooling. An electric conduit running along the top of each row of pipes provides conveniently spaced outlets. Ryan Aeronautical Corporation.

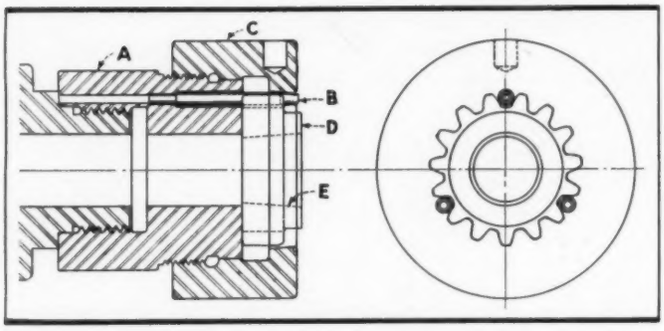
IDEAS FROM PRACTICAL MEN

Gear Wheel Chuck Uses Pins

BY JOHN H. BURKAM

For holding a gear wheel in which a hole is to be ground which must be concentric with the pitch circle to close limits, the chuck shown in the drawing was developed.

Head *A* is screwed onto the machine spindle, which must run true. Spring pins *B* are mounted in the head



Tapered pins in this chuck hold gear wheels for finishing an inside hole to close limits

and thimble *C* screws over the head and contacts the tapered end of the pins.

Gear *D* in which hole *E* is to be finished is placed in the chuck and the thimble tightened. The tapered inner lip on the thimble acts against the tapered end of the pins and locks the gear in position.

The pins should be large enough to contact the gear tooth spaces just a little outside of the pitch line. Three or more pins may be used, and the spacing need not be exactly equal, although the radial location must be accurate.

Spring plungers may be put in for ejecting the work if necessary. The chuck can also be used on plain round parts.

Welding Jig Holds Metal Boxes

BY JOHN E. HYLER

To devise a convenient and workable jig which will enable one to arc weld metal boxes with the joints clamped tightly and true, is something of a problem. In many cases jigs made for the purpose tend to pull the material askew, or else the means for spacing the parts properly are complicated or inadequate. The jig shown here has been found suitable for properly welding together the four sides of a metal box, with the corners overlapping just enough to allow for a proper bead all around the outside corners.

The jig is built with a heavy piece of plate *A* for a base, and near the front, riser *B* is welded at right angles to the base. This riser is a little higher than the required width of the boxes to be made. Riser *B*, in addition to being carefully squared with *A*, is reinforced with two or three triangular gussets *C*, which may be of any thickness of scrap plate. At the top of riser *B*, a piece of round shafting or other convenient material *D* is welded on to form a boss, which will provide adequate threading length for a clamp screw. Screw *E* is mounted, after a hole has been drilled and tapped to receive it.

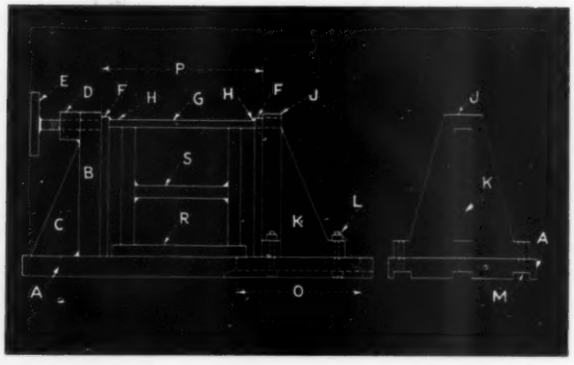
In order that the box may be properly squared up in welding, thrust risers *B* and *J* should fit snugly against it, allowing enough clearance so that expansion will not bind the box in the jig. So that the same jig will accommodate boxes of different lengths, riser *J* is slidably mounted upon baseplate *A*. This allows box sides *FF* to stand true, and side *G* to fit in between them with only a reasonable amount of play, before any pressure from clamp screw *E* is applied.

To provide this sliding action for *J*, plate *K* is welded to it, gusset-style. All three wings of the unit are provided with extended feet, so that they may be drilled to receive clamping bolts. The under side of the base has slots *M* for the bolt heads. To simplify machining of these slots, they are machined in from the end of the baseplate but the upper part of the slots extend only over distance *O*. This avoids undue weakening of the baseplate.

Plate *R* is a flat plate machined to a dimension equal to the thickness of a box side, plus what overhang is allowed to form a corner for depositing weld beads *HH*. It is entirely loose from the balance of the jig.

On *R* is distance-member *S* welded together in the form of the letter *H*. This member is exactly the height of the required inside dimension of the boxes.

In use, the welder sets *J* at the proper place and



This jig holds the four sides of a metal box in the proper position for welding. Built from pieces of steel plate, it does not pull the box askew.

turns back the clampscrew *E* then lays plate *R* on top of baseplate *A* and stands distance member *S* on top of it. He sets ends *FF* in place against the thrust risers, and drops member *G* into place on *S*. Turning up the screw *E* until the joints are tight, he deposits the two beads *HH* with the arc welder.

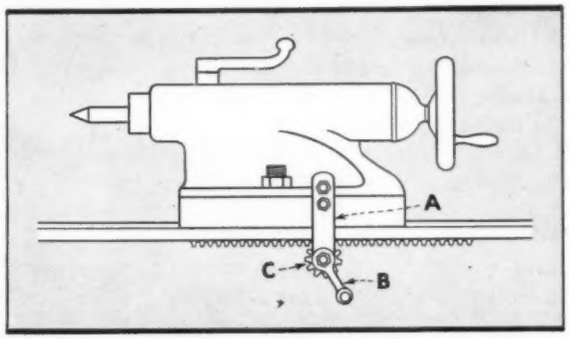
Loosening the clampscrew, he removes the *FFG* assembly, and takes out the loose members *R* and *S*. He inverts the assembly, setting the welded ends down on plate *A*. This time, plate *R* is left out of the jig, but member *S* is set back into place. The last side of the box is dropped into place on *S*, pressure applied with the clampscrew *E*, and the other side of the box welded in place.

The clampscrew threading should be protected against weld spatter. Make a curved cap member of a piece of light metal, and weld it on top of boss *D*, letting it overhang the threading on the screw like a hood. Otherwise the screw will soon become fouled with the spatter of weld metal.

Crank Moves Heavy Tailstock

BY GEORGE HOLMAN

Heavy tailstocks can be readily equipped with a crank to move them easily. Two holes are drilled in the side of the tailstock and anchor bar *A* is attached



With the use of a gear which meshes with the lathe feed rack, a heavy tailstock can be equipped with a crank like this to facilitate moving

by means of capscrews fitting in the holes. A shaft is run through the lower end of this bar. On the outside end of the shaft mount crank *B*. Gear *C* has the same pitch as the lathe feed rack and is mounted on the inside end of the shaft to mesh with the rack. Turning the crank will then move the tailstock.

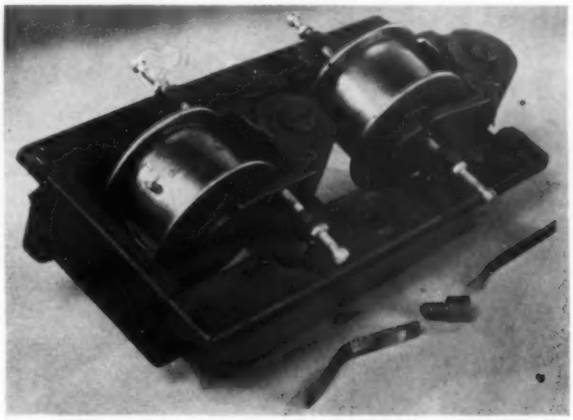
Adjustable Screws Increase Belt Life

BY MAX KHALOS

Westinghouse Electric & Manufacturing Co.

To keep guiding tightener pulleys in the top of a sensitive drill presses in line, and thus lengthen the belt life, a scheme has been devised where adjusting screws replace the flat steel springs for retaining these pulleys in a position which will keep the belts in line.

To use the adjusting screws, it is only necessary to drill and tap a hole through the spring retainer stud. The belt is run over the pulleys in the conventional manner with the pulleys allowed to take whatever po-



Drill press tightener pulleys can be retained in their correct position by replacing the springs with adjustable screws

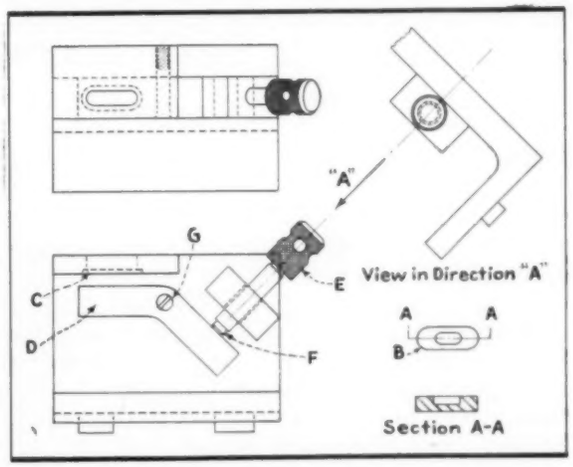
sition they will. The set screws are then run down tight and locked in place by means of a locknut.

The pulleys cannot shift from their position unless the screws are loosened. In this manner, the belt is made to run true and its life is considerably lengthened as a result.

Profiling Fixture Clamps Small Parts

BY ALEX. S. ARNOTT

The fixture shown in the drawing was developed to hold small piece *B* in position for profiling. The work is fitted into the fixture in block *C* and toggle clamp *D* is swung against it. Tightening knob *E* with a pin advances screw *F* which swings the toggle



This fixture readily clamps small piece *B* in block C ready for profiling

clamp on screw *G* and thus locks the work in place.

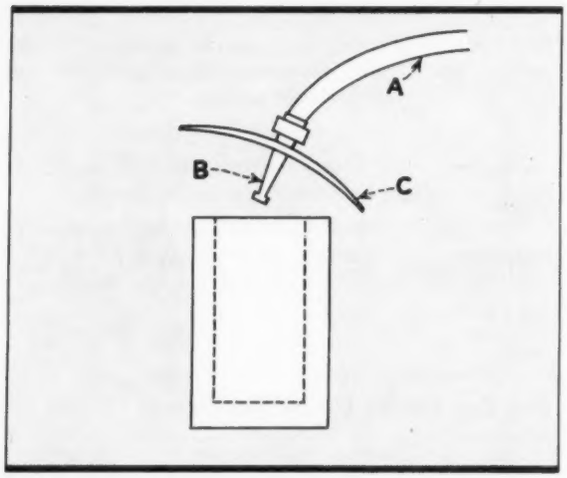
A piece of angle iron serves as the fixture body. The block through which the screw operates and the block in which the work fits are welded to the angle iron. The toggle clamp is mounted to the angle iron by means of screw *G*. The bottom of the angle iron is fitted with two keys to suit the machine.

Shield Keeps Chips Out of Eyes

BY FRANK C. HUDSON

Blowing chips out of a blind hole sometimes causes the chips to fly up in the face of the workman. To avoid this, one shop experimented with a deflector over the nozzle of the air jet.

A lamp reflector was used at right angles to the nozzle but this blew some of the chips back in the hole. In the deflector developed, hose *A* is attached to nozzle *B* over which is fastened shield *C*. The main requirement for the shield is that it be at an angle which will deflect the chips to one side, rather than back into the hole.



Chips can be blown out of blind holes without getting them in the workman's eyes by using a deflector on the air nozzle

Marking Machine Parts

BY THOMAS TRAIL

The relatively simple matter of making marks—such as center punch marks and chisel marks—on machine parts that fit together, for the purpose of identifying their relative positions when disassembling and reassembling them, can sometimes lead to difficulties. For instance, a motor was to be taken from its special frame to be sent out to a shop for overhauling. Before removing the motor from the frame the precaution of scratching identifying marks in the painted surface was taken so that the motor could be replaced in its correct position in the frame later.

When the motor was returned it was discovered that it had been repainted at the shop and thus the scratched marks had disappeared. Had deep center punch or chisel marks been used for identification the paint might not have covered them sufficiently to prevent their being seen. However, a better method of identification would be to place marks on some surface of the respective parts that would not be painted. In this way it is less likely that the marks should disappear.

Furthermore, before placing identifying marks on parts it should be carefully ascertained whether there are already any such marks present. If there are any, it may be difficult to determine which of two or more sets of marks is the correct one.

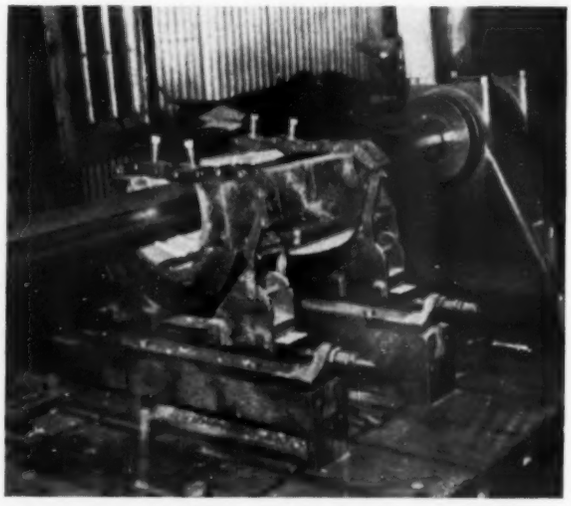
V-Blocks Center Engine Bearing

BY FRED COLVIN

In some sections of Texas small shops make a business of reconditioning saw mill steam engines just as shops in other sections rebuild machine tools. The lower half of a pillow block bearing is shown in the picture in place on a Barret boring machine. The babbit in the bearing is to be rebored to size, the upper section of the bearing is not in place.

V-blocks are used to center the bearing on the table of the machine. The blocks are adjustable by turning the screws shown. Not only is it possible to center the bearing but a certain amount of vertical adjustment is obtained by varying the distance between blocks so that the bearing will rest higher or lower in the V as needed to locate the bearing.

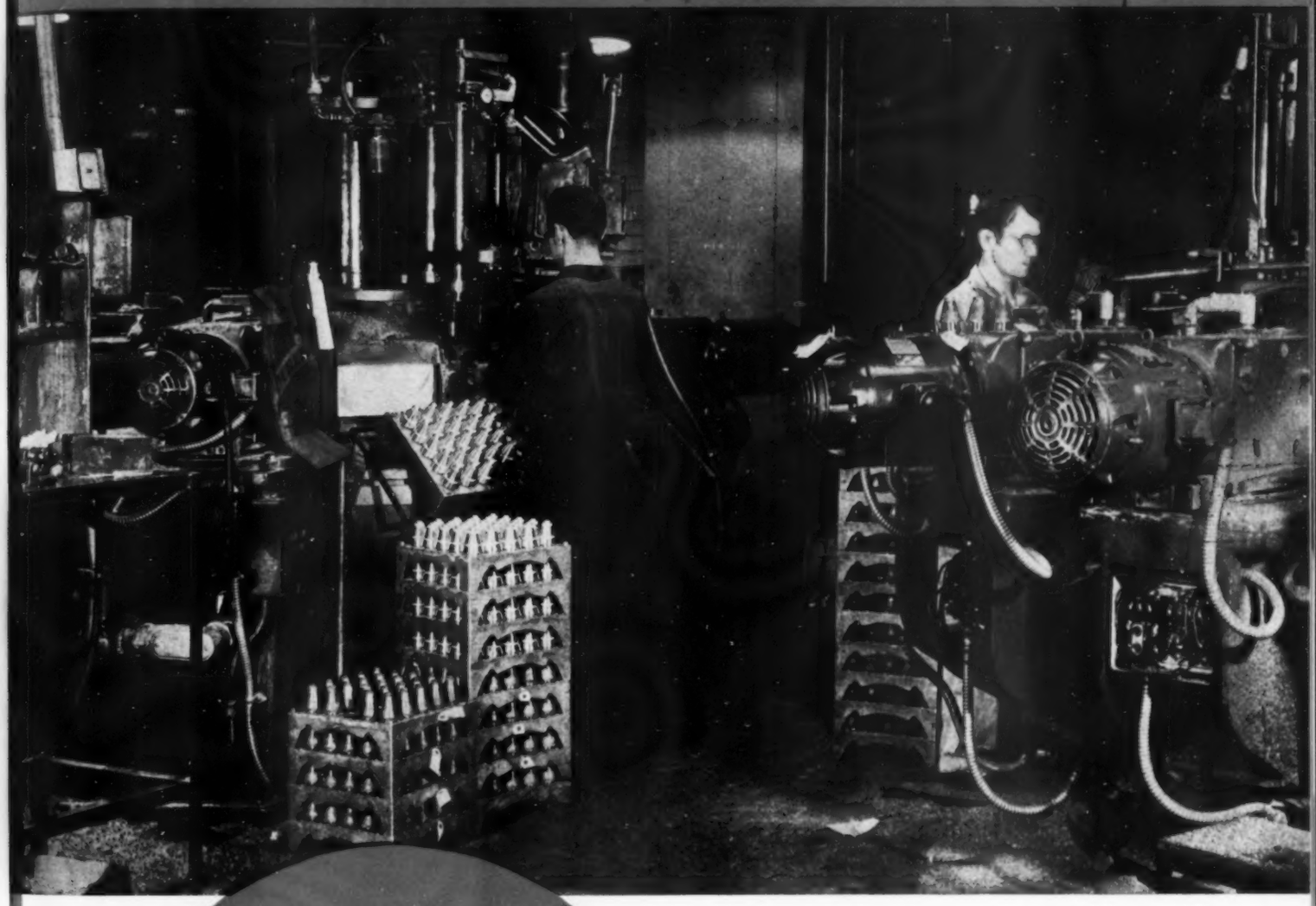
After the bearing is properly located a link chain is brought over the top and hooked on projections on the front of the fixture. Set screws in the chain at the top are tightened to take up slack in the chain and clamp the bearing firmly against the V-blocks before boring is started.



V-blocks are used to center this bearing for reboring, and the link chains clamp the bearing against the blocks

Armament

SECTION OF AMERICAN MACHINIST



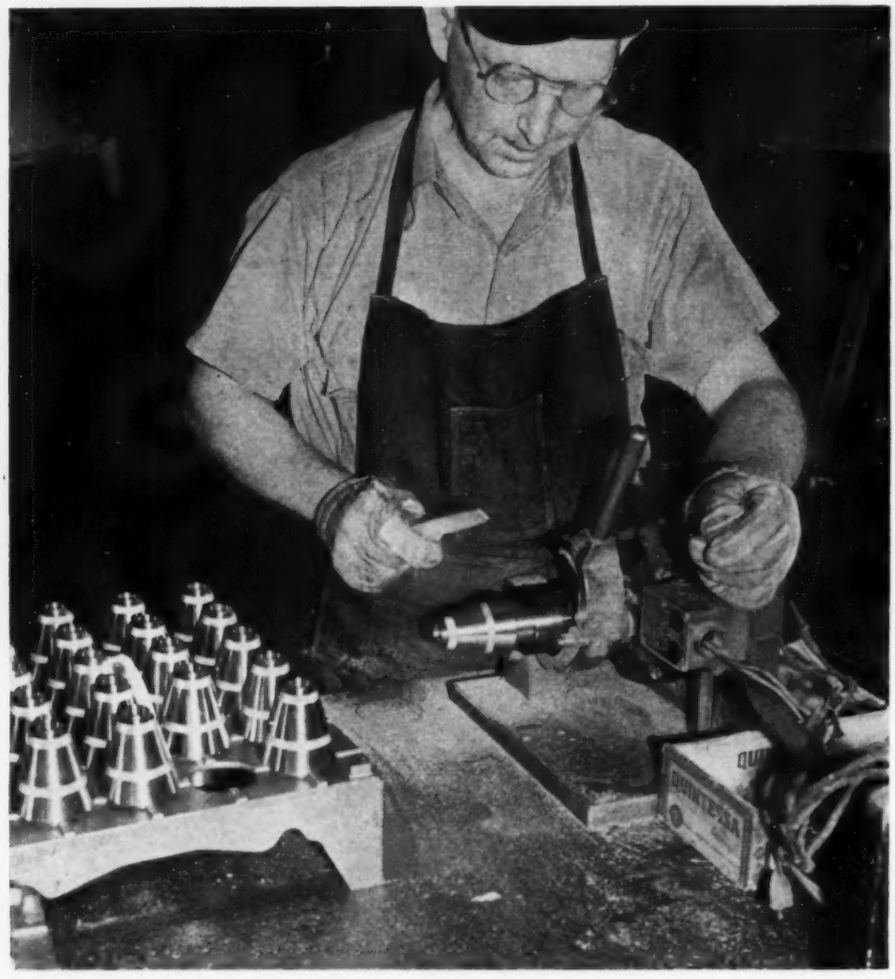
The brass fuze bodies are machined on six pairs of fourteen-station Kingsbury indexing machines

SHELL FUZES By the Million

Carburetor manufacturer has retooled multi-spindle automatics and fourteen-station indexing machines to make percussion fuzes. Special milling and drilling machines speed production

This article has been reviewed and approved by the proper military authorities

SHELL FUZES BY THE MILLION



Burrs are removed from the large end of the tapered body with a file. The body is screwed on the spindle which starts when the handle is raised to the position shown. Lowering the handle cuts the switch and applies a brake. Weight of the body automatically unscrews it from the spindle

INDUSTRIAL AMERICA is swinging into all-out production of war material and equipment. The ingenuity, precision and speed behind the conversion from peacetime to war industry is well exemplified by the efforts of one of America's leading carburetor manufacturers. Their automatic screw machines, automatic drilling, boring and reaming machines, stamping equipment, general-purpose machine tools, other metal-working machines, and heat-treating units, as well as material-handling and inspection facilities, were converted readily for the production of Ordnance material, particularly shell fuzes.

Retooling at this plant for the production of British percussion shell fuzes was completed early in 1941. That for American fuzes followed several months later. Millions of the two types have already been made.

The body of the British fuze is a brass forging. It has octagonal shoulders for collect chucking in a fourteen-station Kingsbury automatic index-type drilling machine. The operations at the fourteen stations, used for machining the threaded end of the fuze body, are shown in Fig. 1. The tool positions shown in dashed lines indicate locations where fine feeds begin. Up to the point shown by the dashed lines, the tools advance rapidly to decrease cycle time.

In these set-ups on the Kingsbury, the fuze bodies remain stationary and the tools revolve. This occasions some difficulties on several operations. For example, at Station 4, where the threaded end is undercut at A and chamfered at B, the tool must be advanced horizontally above its cutting position and then while revolving be fed vertically to the work. This is accomplished by bellcrank C, which moves horizontally $1\frac{3}{8}$ in. before pivot D is locked in a fixed position. During the remaining $\frac{3}{16}$ in. of the total stroke, pin E moves forward. Ratio DE:DF of the bellcrank arms is 2:1; therefore, pin F and the toolholder are advanced $\frac{3}{32}$ in., the required depth of cut.

Spreader tools are used at station 7 to undercut shoulder G for the magazine thread and shoulder H for the detonator-holder thread. In this case, the bellcrank arms have a ratio of 3:2. Therefore, after pivot I comes to rest at the end of $1\frac{3}{8}$ in. of the 2-in. stroke, pin J is advanced $\frac{3}{16}$ in., spreading the tools $\frac{1}{8}$ in. to make the cut. At station 10, where two gas-escape holes are drilled with a two-spindle drill head,

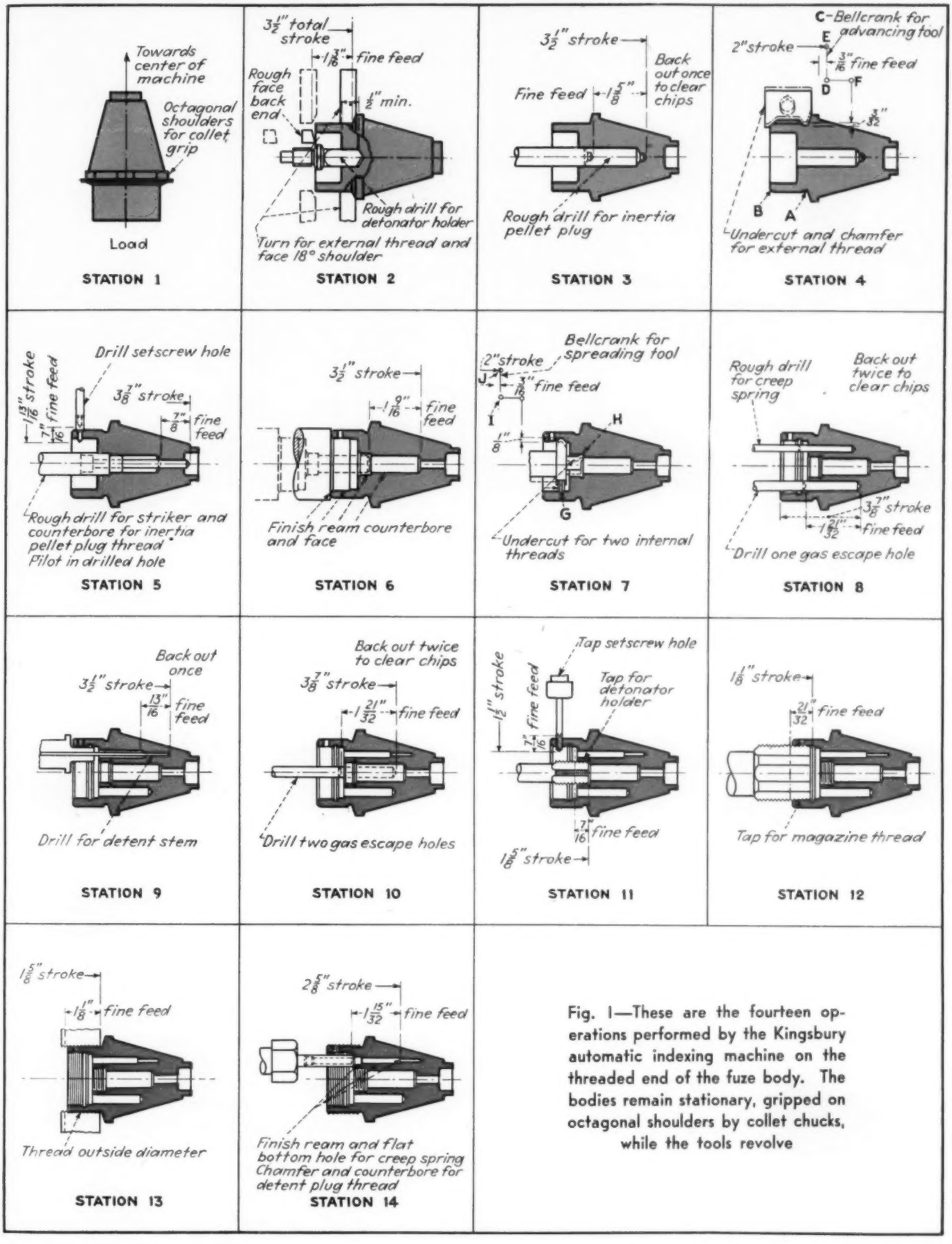
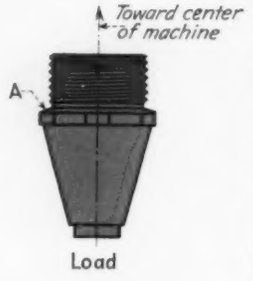


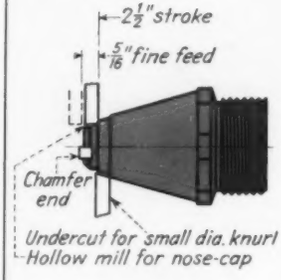
Fig. 1—These are the fourteen operations performed by the Kingsbury automatic indexing machine on the threaded end of the fuze body. The bodies remain stationary, gripped on octagonal shoulders by collet chucks, while the tools revolve



STATION 1

Open

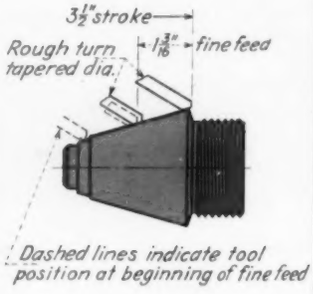
STATION 2



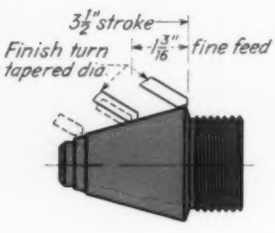
STATION 3

Open

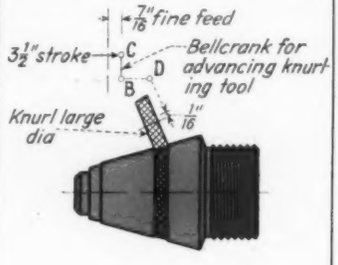
STATION 4



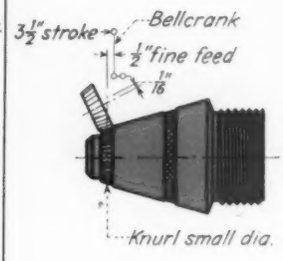
STATION 5



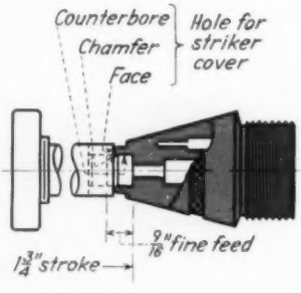
STATION 6



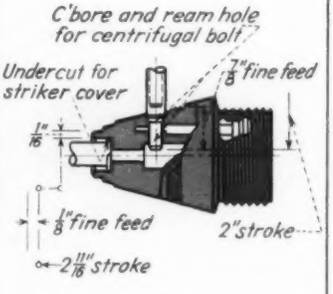
STATION 7



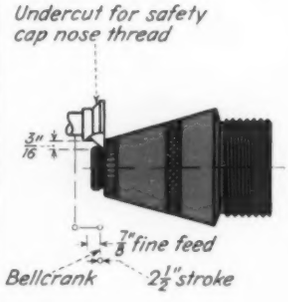
STATION 8



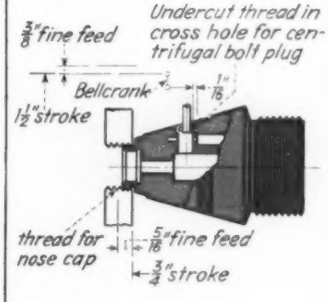
STATION 9



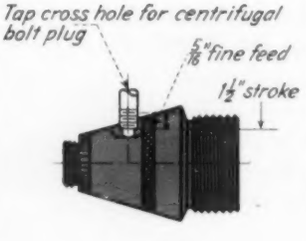
STATION 10



STATION 11



STATION 12



STATION 13

Open

STATION 14

Fig. 2—When the threaded end of the fuze body has been machined, it goes to the second Kingsbury where the tapered end is finished. Except at Station 1, where the body is screwed on a revolving threaded collar, the bodies remain stationary and the tools revolve

Finished bodies from the Kingsbury and burring machines are inspected before other machining is done. Internal and external threads, depth of counterbored holes, and undercuts are checked at this bench

only one drill is shown because the two holes are in the same horizontal plane.

After completing the threaded end of the fuze body, it is taken to a second fourteen-station Kingsbury where the tapered end is finished. The operations are shown in Fig. 2; stations 2, 4 and 14 are open, leaving eleven operating stations.

The body is loaded at station 1 by screwing it on a rotating threaded collar. It is positioned accurately by a locating pin, which is a close fit in the creep-spring hole, and is pulled against threaded shoulder *A* by the revolving collar.

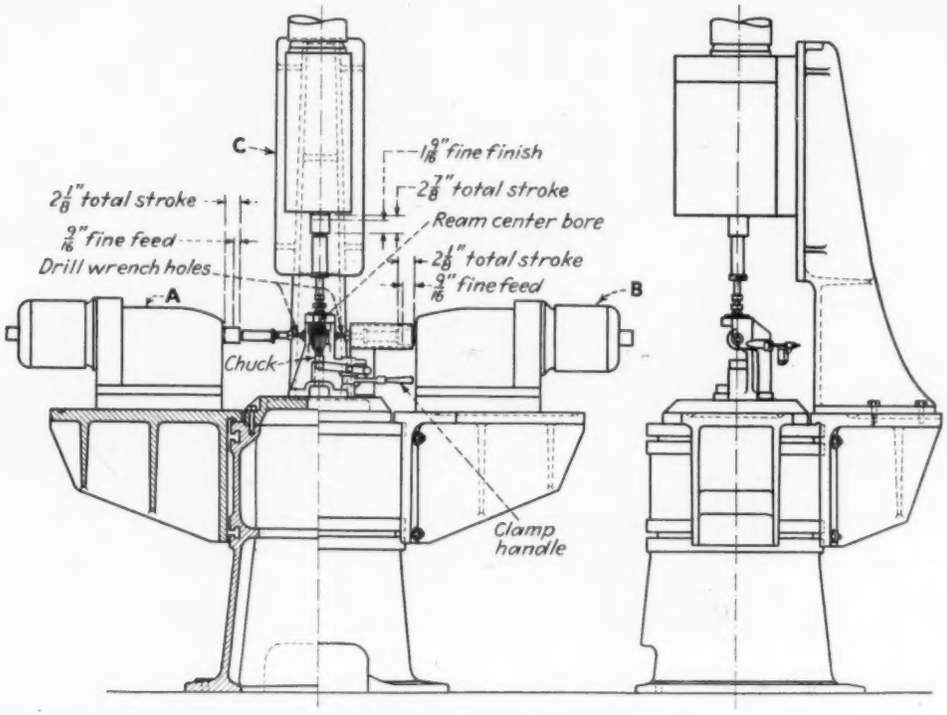
Two tools are used at stations 5 and 6 for roughing and finishing the taper portion of the fuze body. This minimizes the stroke of the toolholder and decreases cycle time; the travel of the second tool stops at the knurl line shown in Station 7, thereby eliminating the necessity for matching exactly its marks with those of the first tool.

Knurling operations are completed at stations 7 and 8. At both of these stations, the knurling tools are first advanced horizontally and then fed obliquely to the fuze body by bellcranks. At station 7, the knurling tool and bellcrank are first advanced $3\frac{1}{16}$ in. of the $3\frac{1}{2}$-in. total stroke, at the end of which pivot *B* is locked in position. A further advance of $\frac{7}{16}$ in. fine feed moves pin *C* and the tool forward $\frac{1}{16}$ in., because the ratio *BC*:*BD* of the bellcrank arms is 7:1. The same principle is involved at station 8 for knurling the nose of the fuze body.

At station 10, the hole for the striker cover is undercut with a spreader tool also operated by a bellcrank. Here the pivot comes to rest after advancing $1\frac{9}{16}$ in., leaving $1\frac{1}{8}$ in. additional travel for the top bellcrank arm. This action transmits a spreading movement of $\frac{1}{16}$ in. to the tool. The hole for the centrifugal bolt, a portion of the striker-pin release mechanism, is counterbored and reamed at this station.

Bellcranks are also used at stations 11 and 12. The one at station 11 advances the tool $\frac{3}{16}$ in. to undercut clearance for the nose-cap thread. The one at station 12, operating from a vertical position, undercuts the thread in the cross-hole for the centrifugal-bolt plug. Only two threads are used for this plug, and these are tapped at station 13. To prevent tearing the two threads, a pilot-tap is used.

Before additional machining operations can be performed, the edge of the body taper adjacent to the threaded end must be filed to remove burrs. This is done on the burring machine shown in one of the illustrations. When the handle on this machine is thrown back, a switch is closed and the spindle rotates at high speed. The operator threads the fuze body on the spindle and while it is rotating he knocks the burrs off with a file. When the handle is brought forward, the motor is shut off and a brake applied simultaneously. This stops the spindle quickly. Inertia causes the fuze body to unscrew itself from the spindle and drop into the operator's hand. The handle is thrown



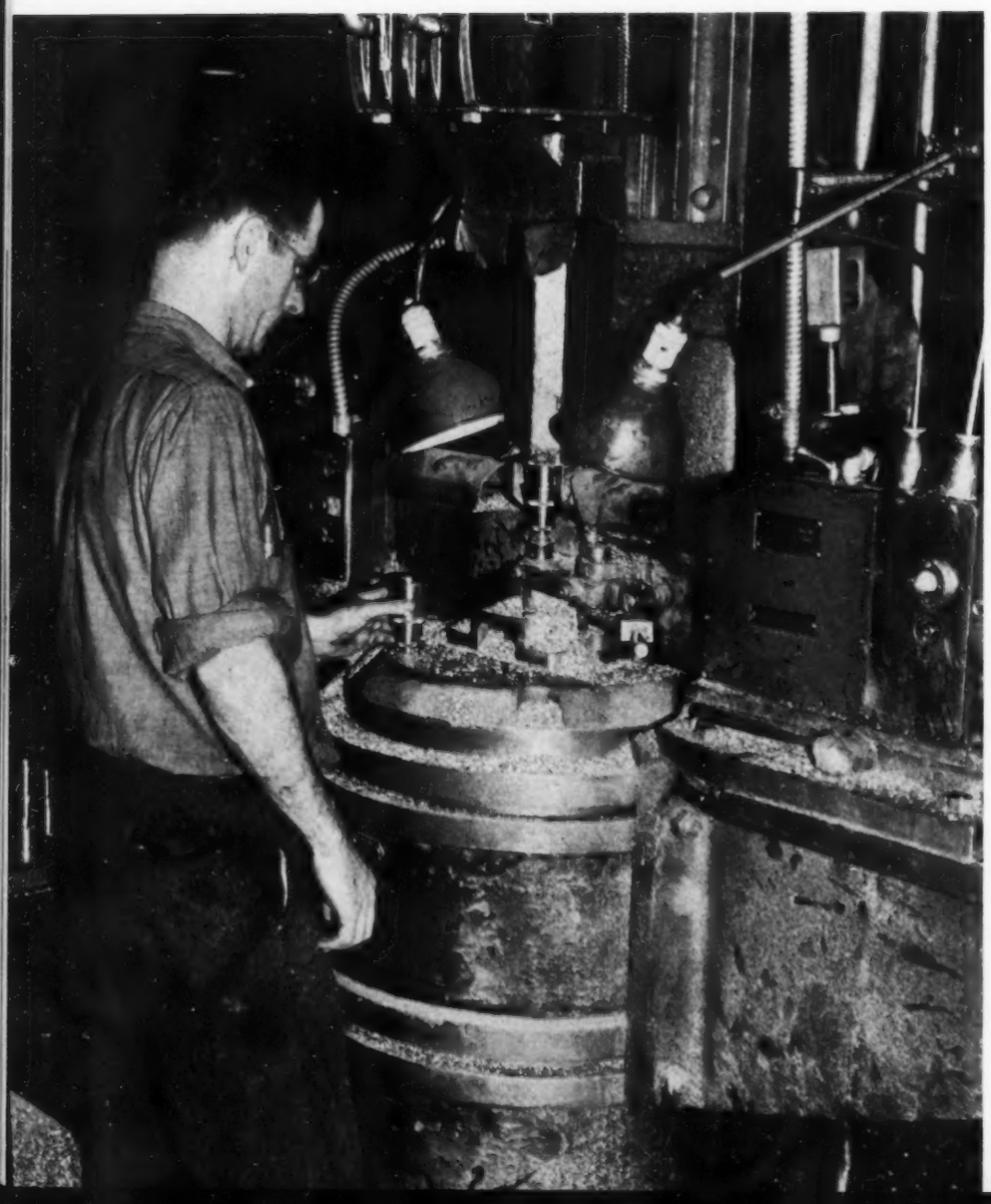


Fig. 3—Final reaming of the center bore and drilling of two wrench-pin holes on the tapered side of the body are finished in this machine. It is controlled by a micro-switch which prevents operation of the Avey drill heads unless the body is located accurately in the fixture

back, a new fuze body threaded into position, and the operation repeated.

In addition to the centrifugal bolt hole on the tapered side of the fuze body, there are two holes for inserting a spanner wrench used to tighten the fuze on the shell. However, the spanner-wrench holes and the centrifugal-bolt hole are not in the same plane. Consequently, intricate tool set-ups would have been required at open stations 2, 4 and 14, shown in Fig. 2, if all three holes were finished on the Kingsbury.

Such set-ups were eliminated in favor of the operations shown in Fig. 3. Here the spanner-wrench holes are drilled by Avey drill heads *A* and *B*. Drill head *C* is used to finish ream the center bore of the fuze body. The distance from the horizontal center line of the centrifugal-bolt hole to one shoulder in the vertical center bore must be held to a tolerance of 0.0015 in. To accomplish this, the fuze body is located by the centrifugal-bolt hole in the fixture.

The machine shown in Fig. 3 was designed and built at this plant, excepting the Avey drill heads *A*, *B* and *C*. The fuze body is placed in the fixture and turned until a locating pin enters the centrifugal bolt hole. This pin is connected to a micro-switch which prevents operation of the drill heads unless the locating pin is correctly positioned in the fuze body. This precludes incorrect mounting of the body in the fixture. The clamp handle can then be brought forward, which operates a toggle to raise the chuck and clamp the fuze body rigidly in the fixture. The drill heads are started by a pushbutton. The machining cycle includes advancing the drills and reamer through guide bushings and retracting them. They stop automatically at the end of the cycle.

Threads in the detent hole at the threaded end of the fuze body are cut with an air-operated Haskins tapping machine, using the fixture shown in Fig. 4 to locate the body. The body is first set on locating pin *A* which enters the center bore. Slide *C* is pushed forward until pin *B* hits the fuze body, which is turned by hand until pin *B* enters the wrench-pin hole. The slide is moved finally against the stop *D*. Then and then only can the air valve shown on the table of the tapper be depressed to operate the spindle.

The foregoing operations complete the machining of the fuze body; however, it must be numbered and lettered. This is done with the machine shown in Fig. 5. The body is set on the spindle and located by

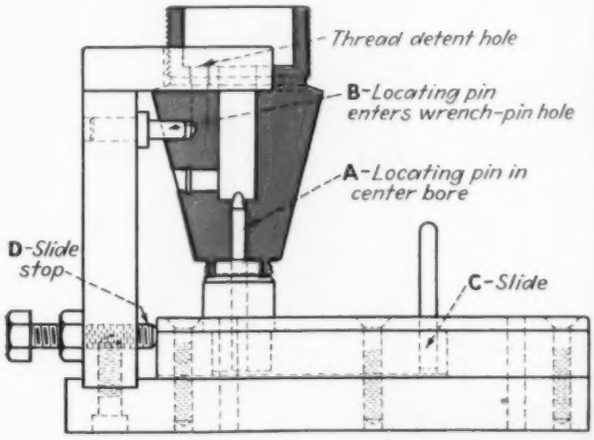
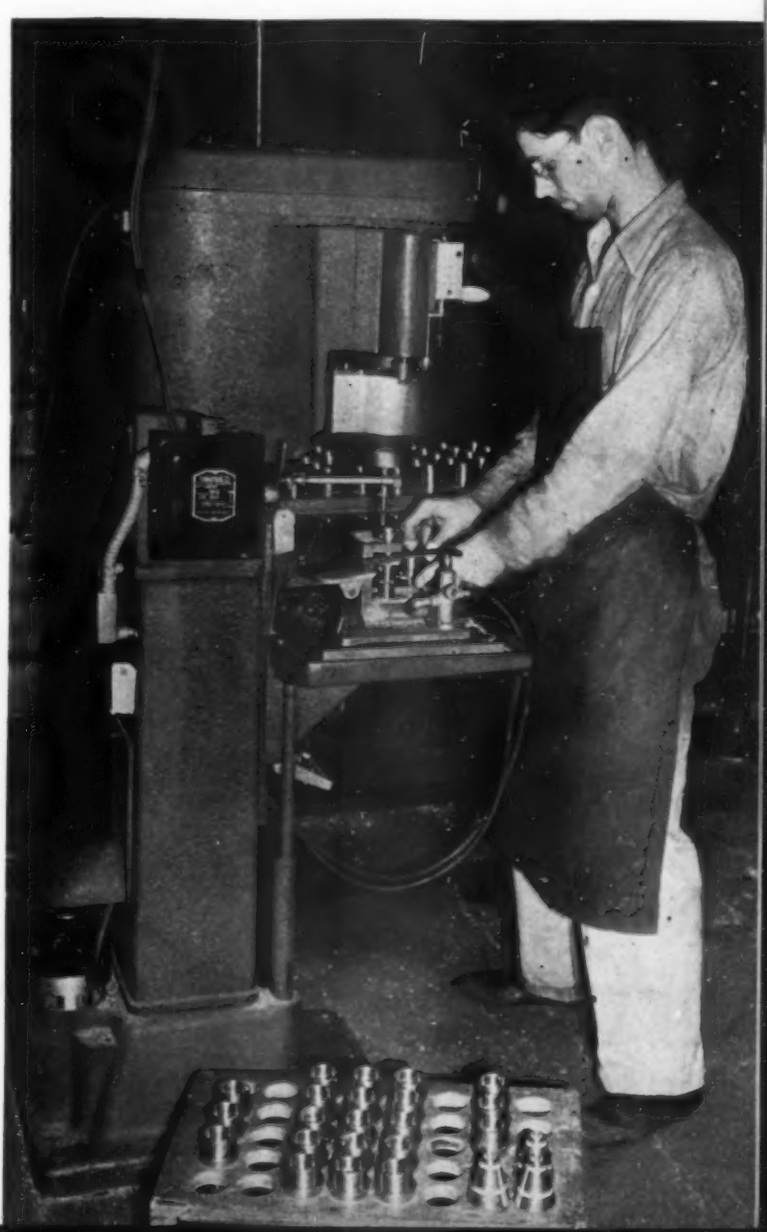


Fig. 4—Threads in the detent hole of the fuze body are cut with an air-operated Haskins tapper. The body is located in the fixture by pins which enter the wrench-pin hole and center bore



two pins that enter the gas-escape holes. The handle is closed, the roll slide advances to the position shown in the drawing, and the top arbor support descends to engage the fuze body and hold it rigid. When the operator depresses the foot pedal, the clutch is engaged and the number roll turns through one revolution, after which the clutch is disengaged automatically. The clutch will not function until the numbering wheel and arbor are in working position.

The magazine for the British fuze is turned from bar stock in six-spindle New Britain-Gridley automatics. The operations are shown in Fig. 6.

At position 1, a circular form tool roughs the body, and the powder-pellet hole is rough driled. At position 2, the flash hole is drilled 7/32 in. diameter. A four-fluted reamer is used at position 3 to flat bottom and rough bore the powder-pellet hole 0.006 in. undersize. In addition, a circular form tool finishes the outside diameter of the body, except the shoulder diameter for the shutter slide. The latter diameter is turned at position 4, where the powder-pellet hole is also finished to size. The large diameter thread is cut at position 5, while at position 6 the small diameter threads are chased. There are but two threads cut on the small diameter at position 6; therefore, a chamfering tool is operated in conjunction with the

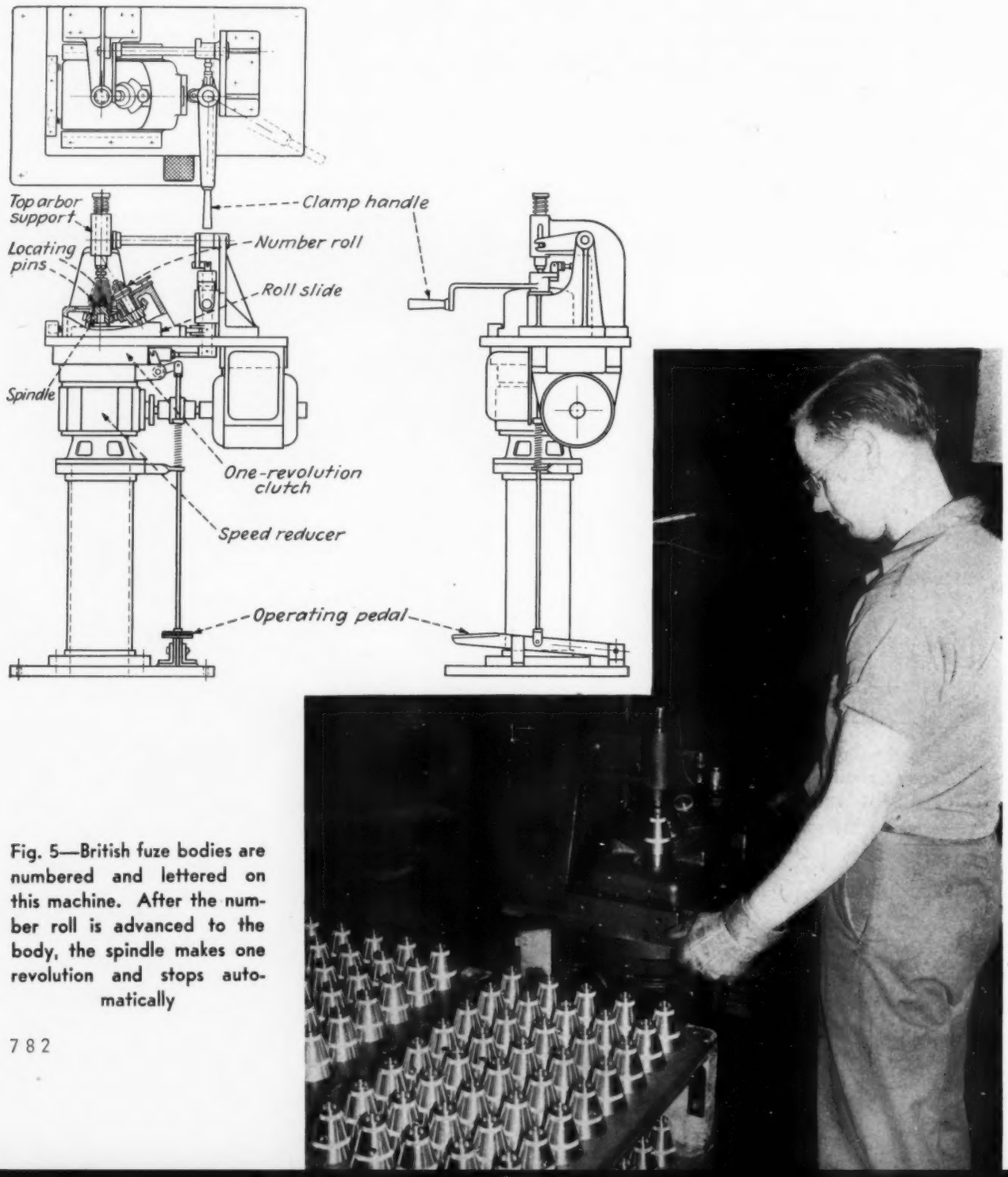


Fig. 5—British fuze bodies are numbered and lettered on this machine. After the number roll is advanced to the body, the spindle makes one revolution and stops automatically

These six-spindle New Britain-Gridley automatics machine component fuze parts such as the magazine, striker pin, nose cap, and detent pins. They operate 24 hours a day, seven days a week

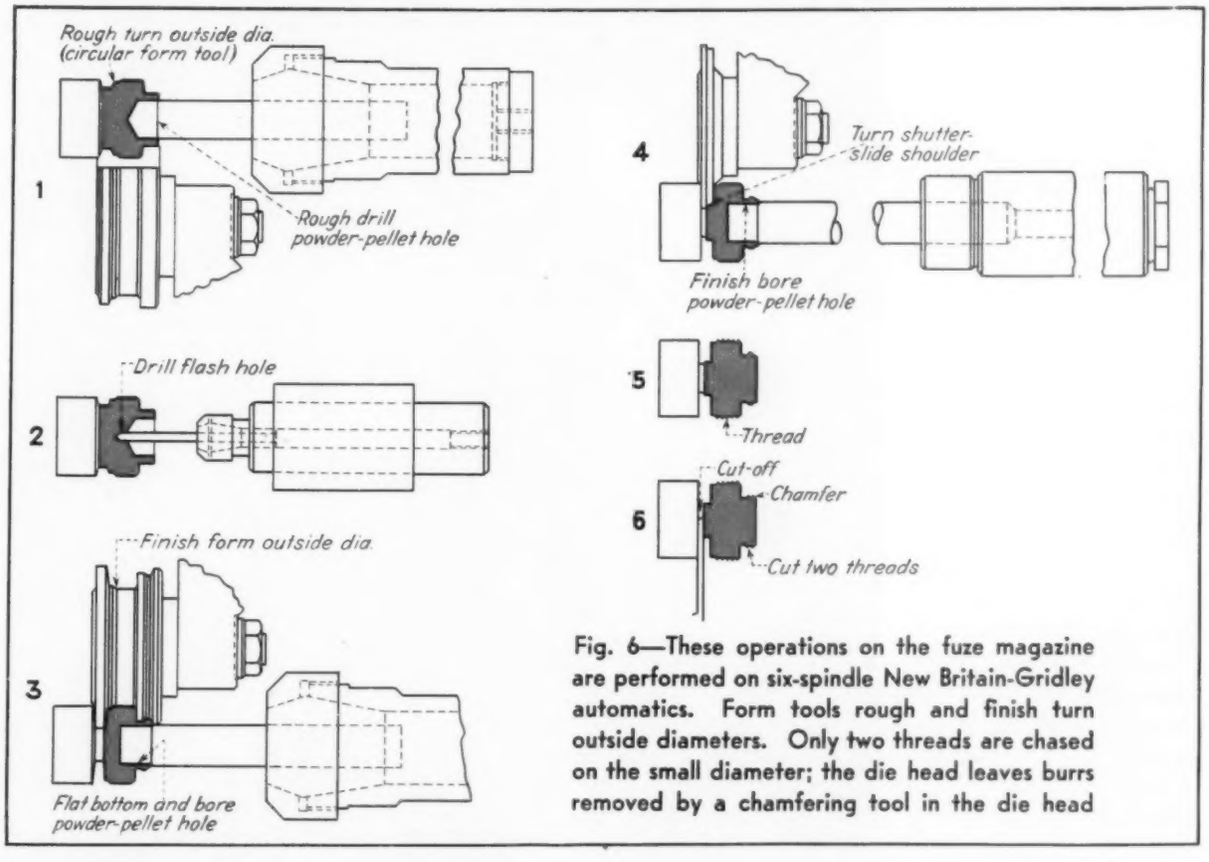


Fig. 6—These operations on the fuze magazine are performed on six-spindle New Britain-Gridley automatics. Form tools rough and finish turn outside diameters. Only two threads are chased on the small diameter; the die head leaves burrs removed by a chamfering tool in the die head

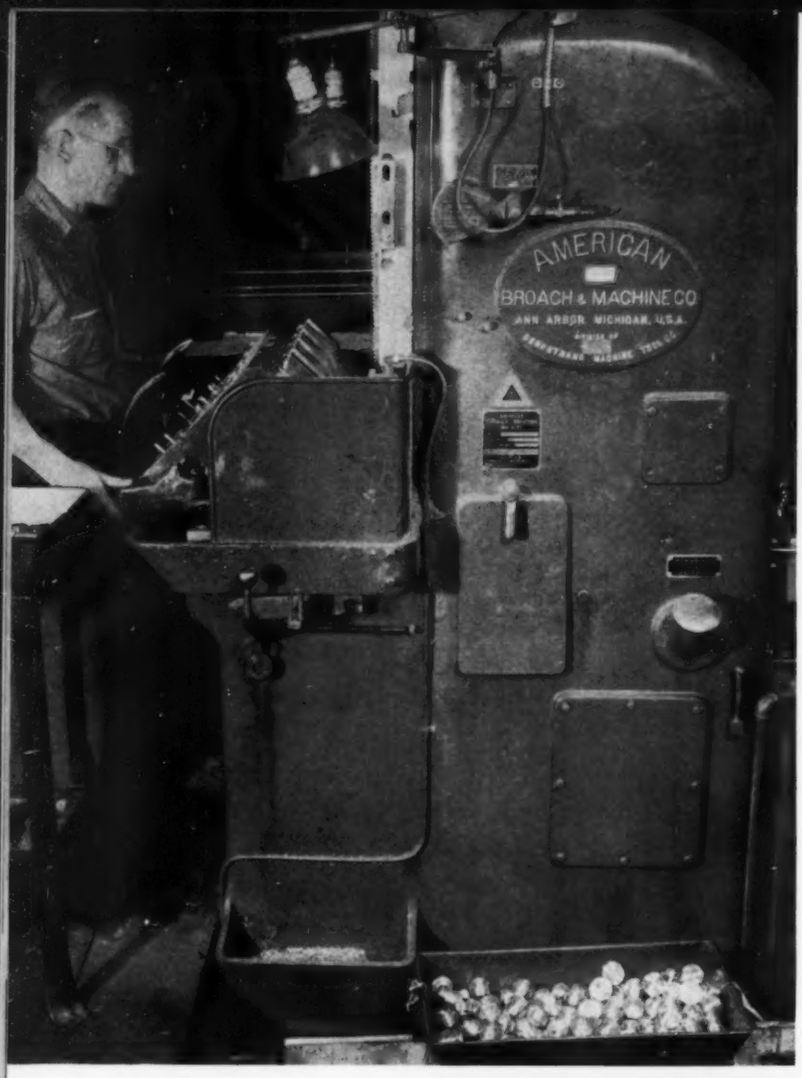
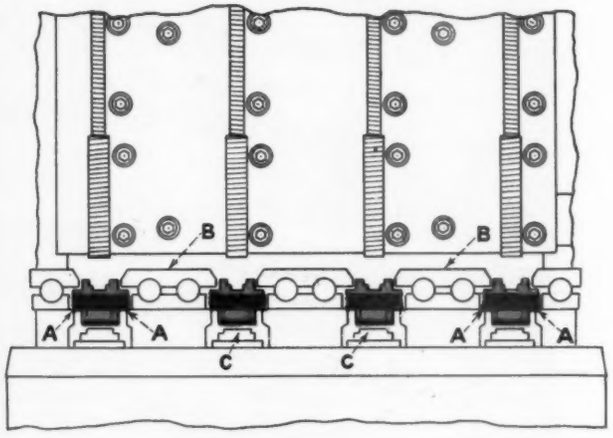


Fig. 7—Four fuze magazines are loaded in this fixture for broaching the shutter slot. The fixture is moved to cutting position by air-operated levers. The slot is roughed and finished in one down stroke of the broach, at the end of which the fixture returns automatically to the loading position shown here



A two-spindle Avey drill head is used to sink four holes of the same diameter in the top of the magazine. Each pair of holes is the same distance apart, but on different center lines; hence, only two drills are required. The magazine is rotated against fixture stops that locate it for each pass of the head

die head to remove burrs caused by starting the die head. This prevents rough edges on the threads, which are objectionable and a source of rejection of the magazine at the inspection bench. After threading, the magazine is cut-off and the cycle repeated.

A shutter-slide slot must be cut in the magazine shoulder. When the shell is fired, the slide which operates in the slot is forced outward by centrifugal force against a light spring, bringing the opening in the shutter in line between the detonator and the magazine of the fuze. Forward motion of the shell releases the detent pin, causing the striker to pass through the open hole in the shutter and hit the magazine, exploding the detonating charge. The slot for the slide is broached, four magazines being held at one time in the fixture shown in Fig. 7 and its accompanying illustration—the fixture is shown in its loading position. Each magazine is set in the fixture with its large diameter resting on ledges *A* and against a stop at the back which prevents it from falling from the fixture when the latter is swiveled through 45 deg. from loading to broaching position. In the illustration of the broaching machine, the operator had just loaded four magazines in the fixture and is beginning to swivel it to working position. During the 45-deg. turn, arms *B* and plungers *C* close on the magazine bodies simultaneously to clamp them rigidly in the fixture. The slot in each magazine is rough and finished to required tolerances in one down stroke of the broach.

After the slot has been broached, a corner of the shoulder must be removed to provide clearance for spring clips that hold the shutter in open position after the shell has been fired. This clearance is cut on a punch press shown in one of the illustrations. The magazine is loaded in the front of the die block on the press platen, located by the shutter slot, and held by a toggle clamp. When the ram descends, the punch enters a hole in the top of the die block and shears the shoulder to form the clearance.

As a final operation, four holes of the same diameter are drilled in the top of the magazine—two in the shutter slot and two on the surfaces adjoining the slot. Each pair of holes is the same distance apart, but on different center lines. Therefore, they are drilled with two passes of a two-spindle drill head, shifting the work against accurate stops for each pair of holes. The magazine is positioned on a locating plug which fits the powder-pellet hole.

Small metal component parts of the British fuzes

Parts not turned on multi-spindle automatics are made on single-spindle Brown & Sharpe screw machines. Floor inspectors check tolerances frequently

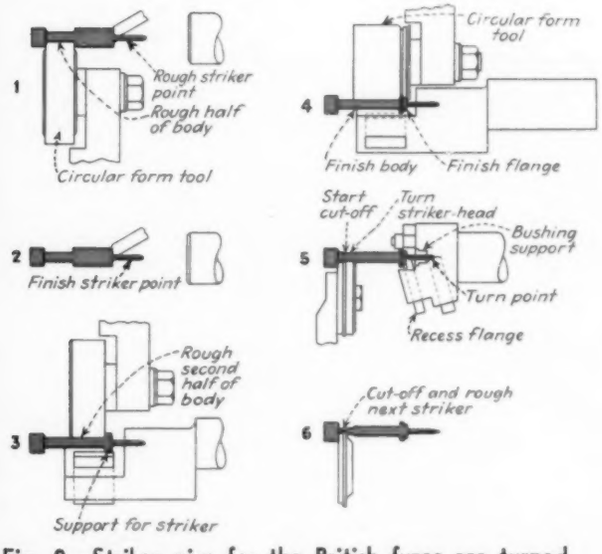


Fig. 8—Striker pins for the British fuzes are turned in New Britain-Gridley six-spindle automatics. The body, flange and point are supported at stations 3, 4 and 5 to prevent the striker from springing

After the machined fuze parts are delivered to the British bond they are inspected visually and checked with gages. Ring, plug and thread gages are used at this bench to check body dimensions

are drilled burred and reamed on batteries of drill presses operated by women. The parts include the shutter, striker head, nose cap, detent pin, and centrifugal pin.

Another interesting operation is the machining of the striker pin. This is done on No. 60 New Britain-Gridley automatics from $\frac{9}{16}$-in. round stock. The operations performed at each of the six spindles are shown in Fig. 8. At position 1 a circular form tool roughs half the length of the striker body, while a three-blade hollow mill roughs the point. At position 2, the striker point is finish turned with a four-blade hollow mill. At position 3, the remaining portion of the body is roughed; during this operation the striker is supported on the flange adjacent to the point. The striker body and flange adjacent to the striker pin are machined to finish size at position 4, removing about 0.010 in. from the body. A circular tool at position 5 turns the diameter on which the striker head is mounted; in addition, the flange adjacent to the point is recessed, and the striker-point sharpened. During the latter two operations, the flange is supported by a roller, while the striker point is centered in a bushing to prevent this slender part from springing while being sharpened. At position 6, the striker is cut-off; the parting tool is shaped to rough form the point of the stock from which the next striker is to be made. The cycle is then repeated.

In addition to the fuze body, magazine and striker, the following parts are machined on automatics; bottom cap, safety or nose cap, striker head, centrifugal bolt, detent pin, detent plug, inertia pellet, detonator holder, magazine pins and threaded plugs for detent and centrifugal-bolt holes.

Production from all machines is determined by placing the parts in tote pans and weighing them. The scale is calibrated to read in number of pieces in each pan, rather than recording their total weight. They are then delivered to the British bond where each piece is inspected individually and degreased before going to the assembly line. However, the bodies, magazines and bottom caps are shellacked immediately after being degreased—they retain enough heat from the hot degreasing solvent to dry the shellac promptly.

After the magazine and shutter have been assem-

At this section of the assembly line, the magazine, striker, striker head and striker cover are added to the fuze body. There are identical fixtures on both sides of the assembly bench to keep the fuzes moving evenly

All parts of the fuze must be thoroughly clean before going to the assembly line. They are placed in baskets and passed through a boiling solvent by the conveyor of this degreasing unit

Each magazine and shutter assembly is subjected to two spin tests on constant-speed spindles running at 1,300 and 1,700 r.p.m., respectively, the low and high limits of the arming speed

bled, the unit is spun at high speed to determine whether or not the shutter will open to arming position at the centrifugal speed attained by the shell upon being fired. The bench at which this spin test is performed is shown in one of the illustrations. The spindles on which the magazines are screwed project obliquely from the table top. Each magazine is run through two of the spin testers, which are set at the low and high limits of the arming speed, respectively. The shutter must not move to arming position on the low-speed tester, while it must arm on the one set at the high speed; otherwise, the assembly is rejected.

On the assembly line the striker is placed in the fuze body. This is followed by the detent and detonator assemblies. The striker head is located and attached mechanically, after which the striker cover

The striker, several subassemblies and a plug, the latter of which is cemented and staked, are added to the body at the beginning of the assembly line. Inspectors are stationed at several places on the line to check the work

The fuze bodies, magazines and bottom caps are shellacked immediately after being degreased. The parts retain enough heat from the boiling solvent to dry the shellac promptly. All spraying is done in booths equipped with suction fans

is forced into position by a hand-operated arbor press. Finally, the magazine assembly, nose cap and bottom cap are screwed in place. British inspection has controllers at all vital points on the assembly line who check the contractor's work and place their acceptance seal on the fuzes. The fuzes are packed in cardboard cartons for shipment to the filling plants.

Production of American Fuzes

Besides the millions of percussion fuzes made for British shell, this company has tooled up for the production of an American percussion fuze. Its basic parts are the nose, ogive, nose assembly stud, body, plunger, closing screw, striker pin and release mechanism. All the parts, except the ogive which is a die casting, are made on automatic screw machines. Final milling and drilling are done on special units designed the company's engineers.

The steel body of the fuze is turned and bored in six-spindle Conomatics, the operations on which are shown in Fig. 9. At position 1, the body diameter is roughed, the thread diameter is machined with a knee tool leaving 0.010 in. on the face and shoulder for finishing, and the plunger-body hole is partly

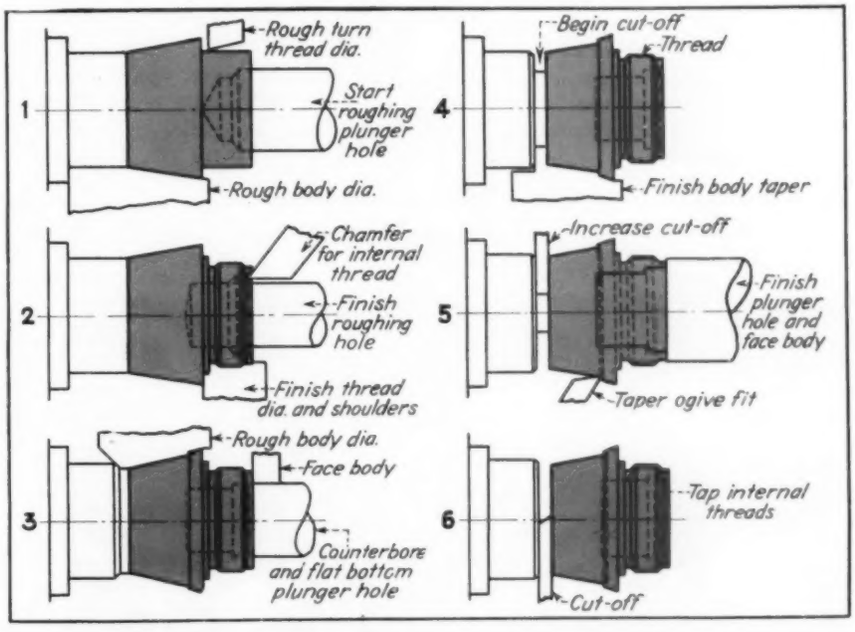
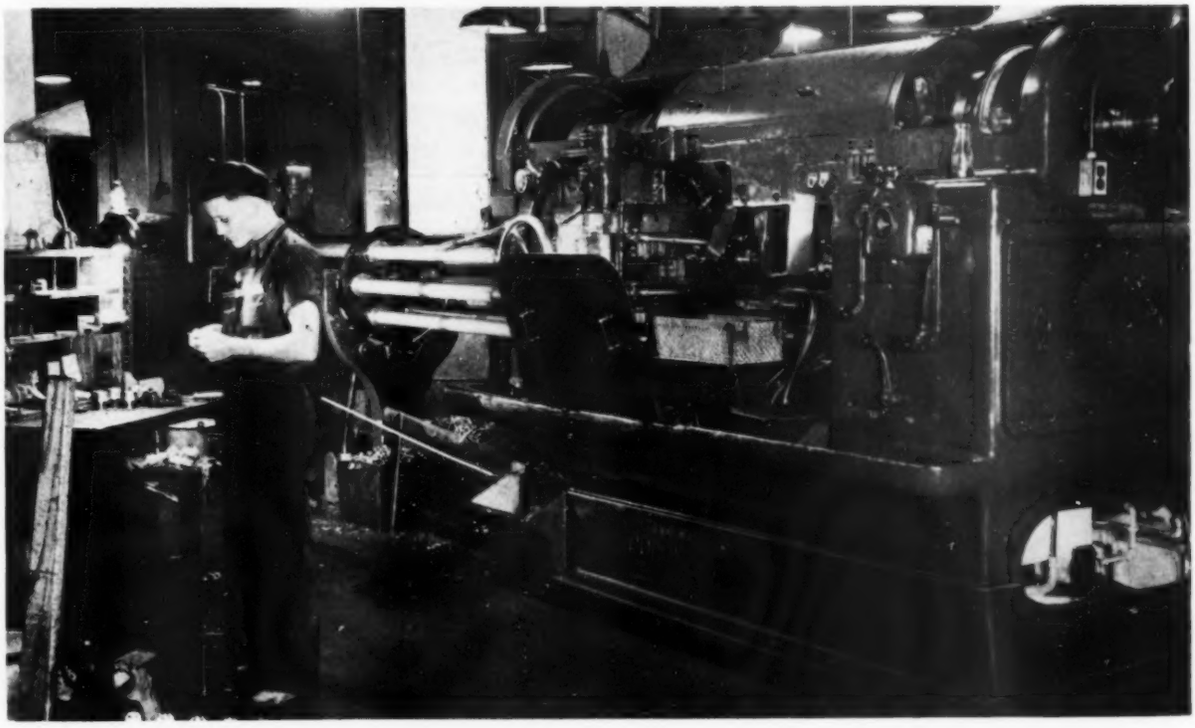


Fig. 9—Sixteen operations, including threading and tapping, are performed on the steel fuze body in this six-spindle Conomatic. A load of six bars weighs 1,200 pounds



KINGSBURY OPERATIONS ON STEEL FUZE BODY

Station No.*	Operation	Spindle speed, r.p.m.	Tool feed, in. per rev.	Fine feed on cam, in.	Cutting time, sec.	Tool description
1	Load fixture	....	.....	.....	....	Keller reversible chuck
2 V	Drill first part of sleeve-setting hole	700	0.0053	0.300	7.00	1/2-in. drill in rotary bushing
3 V	Drill second part of sleeve-setting hole	700	0.0050	0.230	6.35	Step drill in rotary bushing
4 V	Drill third part of sleeve-setting hole	845	0.0045	0.300	7.00	27/64-in. drill
4 A	Drill first part of tube hole	1075	0.0040	0.300	7.00	11/32-in. drill in rotary bushing
5 A	Drill second part of tube hole; first of small hole	1178	0.0041	0.350	6.70	11/32 to 5/32-in. step drill
6 V	Flat-bottom sleeve-setting hole	840	0.0030	0.180	7.00	27/64-in. drill in rotary bushing
6 A	Finish drill small tube hole	2180	0.0030	0.500	6.70	5/32-in. drill
7 A	Flat-bottom and chamfer tube hole	965	0.0040	0.280	6.75	T-drill in rotary bushing
8 V	Drill first part of interrupter hole	1550	0.0041	0.375	6.90	0.209-in. drill in plain bushing
9 V	Drill second part of interrupter hole	1550	0.0041	0.375	6.90	0.209-in. drill
10 V	Flat-bottom interrupter hole	1550	0.0026	0.180	6.90	0.209-in. drill in plain bushing
11 V	Counterbore and ream sleeve-setting hole	965	0.0068	0.500	6.90	.....
11 A	Ream small tuble hole	2360	0.0038	0.600	6.70	5/32-in. reamer
12 V	Ream interrupter hole	1750	0.0054	0.594	6.70	0.225-in. reamer
13 V	Tap sleeve-setting retainer hole	290	0.0312	.....	6.85	0.5625-in. 32 N.S. tap
13 A	Tap tube hole	290	0.0416	.....	6.65	0.400-in. 24 N.S. tap
14 V	Stamp identification mark on fuze body	....	.....	.....	....	Boyer air riveter

**Letters A and V refer to the angular and vertical tools, respectively, shown in Fig. 11.*

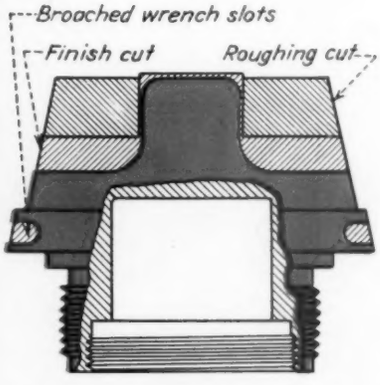


Fig. 10—The tang of the fuze body is shaped on a Cincinnati duplex broach. While one fixture is being loaded, the other is in cutting position; they index automatically at the end of the broaching and return strokes. Each broach roughs and finishes a body on each stroke

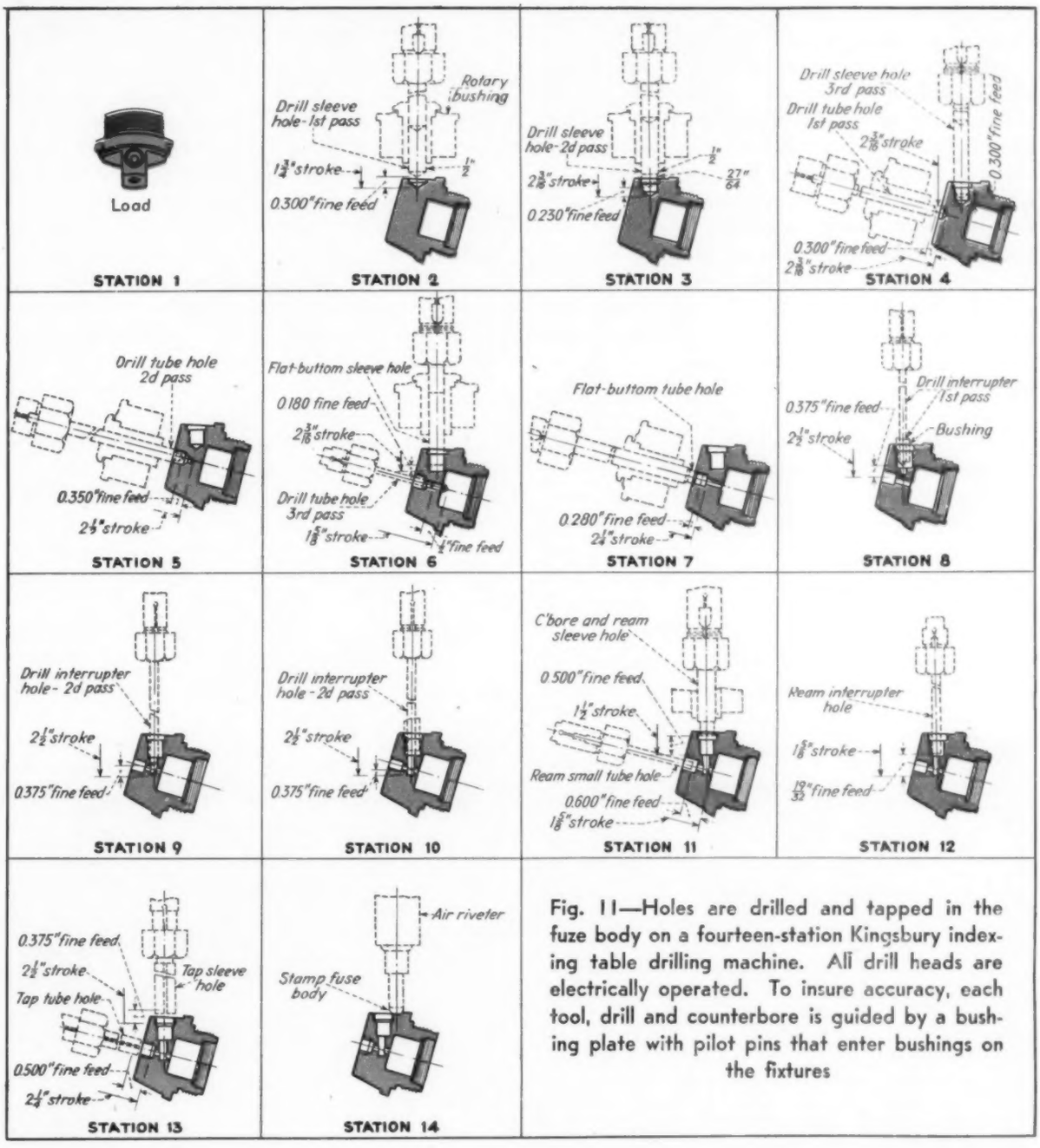


Fig. 11—Holes are drilled and tapped in the fuze body on a fourteen-station Kingsbury indexing table drilling machine. All drill heads are electrically operated. To insure accuracy, each tool, drill and counterbore is guided by a bushing plate with pilot pins that enter bushings on the fixtures

rough drilled and centered. At position 2, a form tool on the cross-slide finishes the threaded portion of the body and finish faces the shoulder. A drill on the turret completes the roughing of the plunger-body hole. A chamfering tool on the turret then cuts the lead for an internal thread for the closing screw; this chamfer is only to the root diameter of the first thread.

A form tool at position 3 takes a second roughing cut on the tapered section, while a facing tool on the turret finishes the plunger end of the body. Also, the plunger hole is rough counterbored and flat bottomed. At position 4, a form tool on the cross-slide finish forms the tapered section of the body and starts the breakdown for the cut-off tool. A die head, advanced by the turret, cuts the external body threads. At position 5, a tool on the cross-slide increases the breakdown for the cut-off tool, a taper-turning attachment cuts the ogive fit, and a turret tool flat-bottoms, reams and finish counterbores the plunger-body hole as well as facing the end of the body. The internal diameter of the plunger-body hole is tapped and the

fuze body cut-off at position 6. Then the stock is advanced to repeat the cycle.

Following the operations on the Conomatic, the tang on the fuze body is broached as shown in Fig. 10. On the table of the duplex Cincinnati broach are two fixtures, each of which holds two fuze bodies—one to be roughed and one to be finished. Each fixture is synchronized with its broach to index automatically from cutting to loading position at the end of the broaching stroke, and from loading to cutting position at the end of the return stroke of its broach. Since the strokes of the two broach slides are alternated, cuts are made on the two fuze bodies in one fixture while the other fixture is being loaded. Loading is completed before the broach at the other fixture has reached mid-stroke.

From the broach, the fuze bodies are taken to a fourteen-station Kingsbury where the sleeve-setting and tube holes are drilled and tapped, and the interrupter hole is drilled and reamed. The operations are shown in Fig. 11, while pertinent data on each are given in the accompanying table. The fuze body is loaded on a Keller reversible air chuck at station 1. The drills for making the first two passes in the sleeve-setting hole at stations 2 and 3 are guided by rotary bushings—no bushing is used at station 4 where this hole is drilled to final depth. The large diameter of the tube hole is started at station 4, drilled to depth at station 5, and flat bottomed at station 7 with the drills guided by rotary bushings. The small diameter of the tube hole is drilled through to the plunger-body recess at station 6 and reamed at station 11. The interrupter hole is drilled in two passes at stations 8 and 9, a plain bushing being used to guide the drill when starting the hole. A similar bushing is used at station 10 where this hole is flat-bottomed. The sleeve-setting and tube holes are tapped at station 13. Identification marks are stamped on the fuze body at station 14 with a Boyer air riveter. These operations complete the fuze bodies, except for removing burrs. After inspection, they are cadmium plated.

The plunger body is turned and bored from solid stock in New Britain-Gridley automatics. The next operation on this part of the fuze is to mill the slot for the centrifugal-plunger lock pin. This is done in a two-spindle end mill, as shown in one of the illustrations. Two plunger bodies are set one above the other in a split fixture which is closed by half a turn of the clamp handle. The table and fixture move horizontally into the two cutters to mill the slots. At the end of the return stroke the plunger bodies are

The operations on the American fuze body, shown in Fig. 11, are performed on this Kingsbury automatic

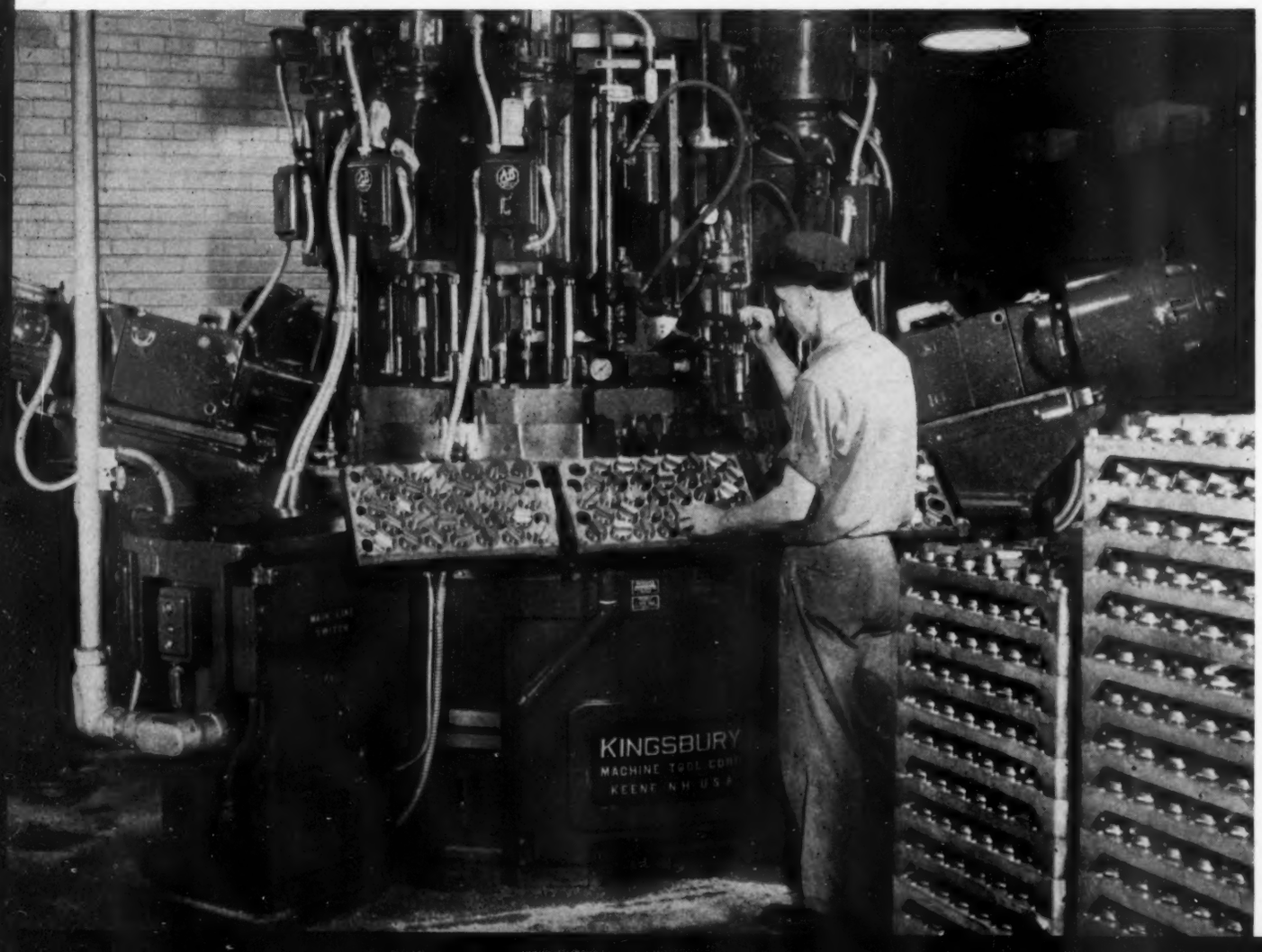
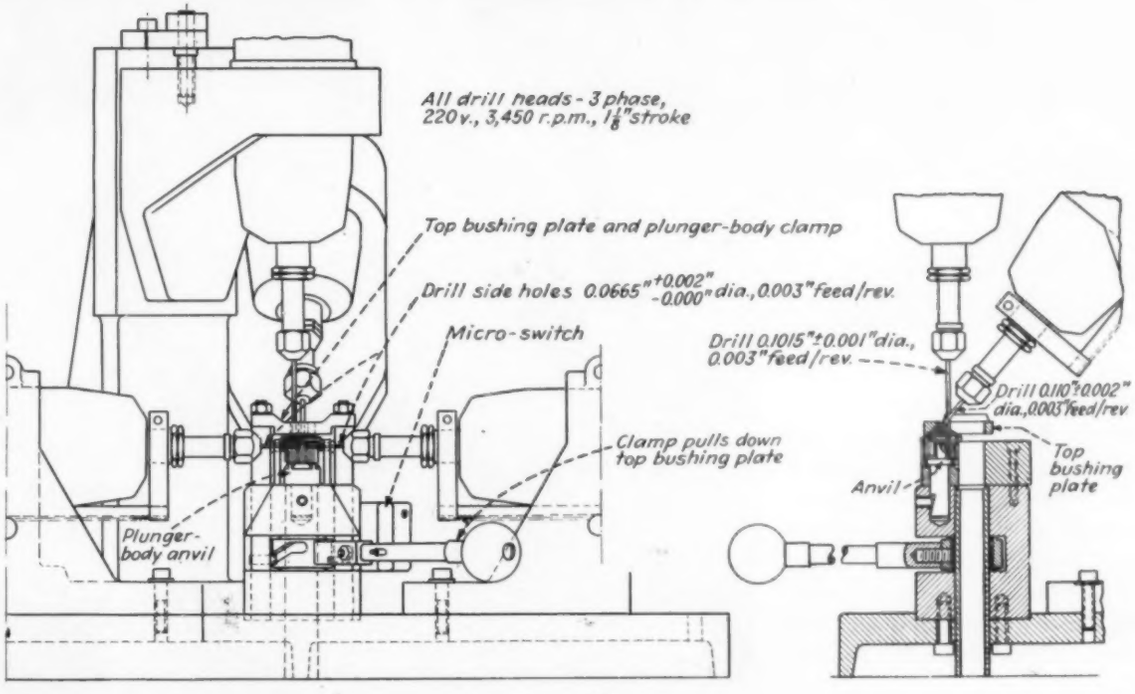


Fig. 12—Four holes are drilled in the plunger body on this multi-head special drilling machine. The top bushing plate clamps the body on the anvil. A limit switch prevents operation of the Grove-Nelson drill heads until the plunger body is positioned properly in the fixture

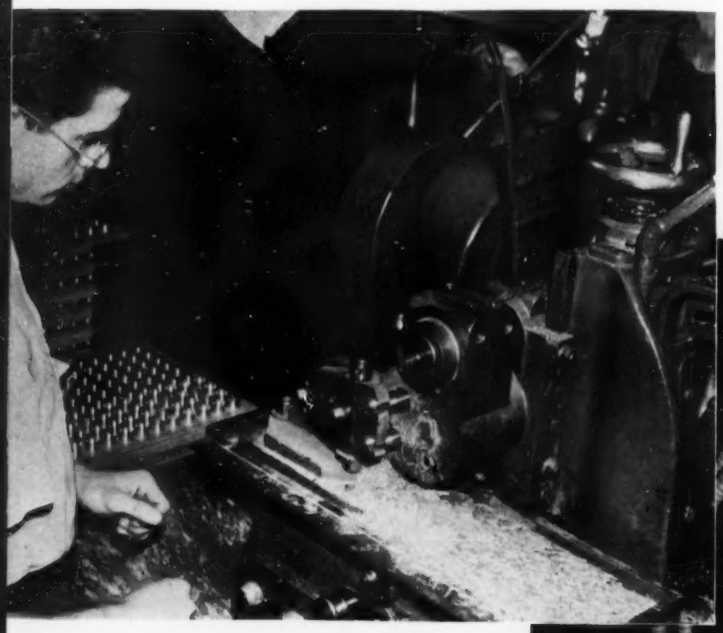

All drill heads - 3 phase, 220 v., 3,450 r.p.m., 1 1/8" stroke
Top bushing plate and plunger-body clamp
Drill side holes 0.0665" +0.002" -0.000" dia., 0.003" feed/rev.
Micro-switch
Drill 0.1015" ± 0.001" dia., 0.003" feed/rev.
Drill 0.110" ± 0.002" dia., 0.003" feed/rev
Clamp pulls down top bushing plate
Top bushing plate
Anvil
Plunger-body anvil

removed and new ones inserted. Following this operation, seven holes are drilled in the plunger body.

The machine for drilling four of these holes is shown in Fig. 12. It was designed by this company's engineers, excepting the Grove-Nelson drill heads, which are mounted at the correct drilling angle on a single base. The plunger body is placed on the anvil, located by the slot for the centrifugal-plunger lock pin, and clamped in the fixture by the top bushing plate which is brought down by moving the clamping handle from left to right. The drill heads will not operate until the plunger body is located accurately in the fixture, this being ascertained by the position of the top bushing plate to which a micro-switch is interconnected. Once the plunger body is clamped properly, the circuit is closed by a push-button. The vertical and angular drills then advance into their guide bushings in the top plate and into the plunger body. The horizontal drills run permanently in their guide bushings and advance simultaneously with the vertical and angular drills. All drills automatically retard to starting position and stop. The two horizontal holes must be in perfect alignment; this is checked with a gage by an inspector assigned to this one machine.

The three remaining holes to be sunk in the plunger body are drilled with a three-spindle machine similar in design to the one shown in Fig. 12. As can be seen from the illustration of this three-spindle drill, the plunger body is inverted and is slid on an anvil into its fixture. It is positioned by the slot for the centrifugal-plunger lock pin. When located accurately, the operator swings the clamping handle through 45 deg., which pulls the top bushing plate down on the body, operates a micro-switch, and closes the circuit to the drill heads.

Throughout the various departments, each part of the fuze is checked by plant inspectors immediately after machining operations are complete. Parts are checked by government inspectors prior to and during assembly. Metal parts of the fuze, including the plunger body, bottom cap and nose, are degreased. The parts are loosely assembled, packed in cartons and shipped to the filling plant.



The wall of the plunger body is slotted. For this operation, two plunger bodies are clamped in a split fixture and advanced automatically to the end milling cutters. The table advances rapidly, bringing the work to the end mills, then slows to cutting speed, and returns quickly to loading position

Three additional holes are drilled in the plunger body on this machine. Here, too, a limit switch prevents operation until the body is located accurately in the fixture. Ball-bearing bushings and stops on the tools insure correct depth of holes

Translating Thread Standards—III

FOR THE 29-deg. stub thread, the angle between the sides of the thread is 29 deg. as in the case of the general-purpose Acme series, the threads are truncated top and bottom, but the basic depth of thread is reduced to 0.30 of the pitch. The basic thread thickness is one-half the pitch as before, and the threads are symmetrical about a line perpendicular to the axis of the screw. This produces a very strong thread section and, in addition, a thread admirably suited to applications where space limitations or other economic considerations make a shallow thread desirable. Basic dimensions of the 29-deg. stub thread are given in Table 4.

In the 60-deg. stub thread, the angle between the sides of the thread is 60 deg. The threads are truncated top and bottom, have a basic depth of 0.433 of the pitch, a basic thickness of one-half the pitch, and are symmetrical about a line perpendicular to the axis of the screw. Basic dimensions of this thread are given in Table 6.

With the 10-deg. modified square thread, the angle between the sides of the thread is 10 deg. The threads are truncated top and bottom, have a basic depth of 0.50 of the pitch, a basic thread thickness of 0.50 of the pitch, and are symmetrical about a line perpendicular to the axis of the screw. The angle of 10 deg. results in a thread which is the equivalent of a "square thread" in so far as all practical considerations are concerned.

Definitions

Angle of Thread. This is the angle between the sides of the thread measured in an axial plane. For the Acme screw thread it shall be 29 deg. The line bisecting this 29-deg. angle shall be perpendicular to the axis of the screw thread.

Depth of Thread. The basic depth of thread, h, shall be the distance between the basic major diameter of screw, D, and basic minor diameter, K, of nut perpendicular to the axis.

Thickness of Thread. The basic thickess of the thread, t, is the distance

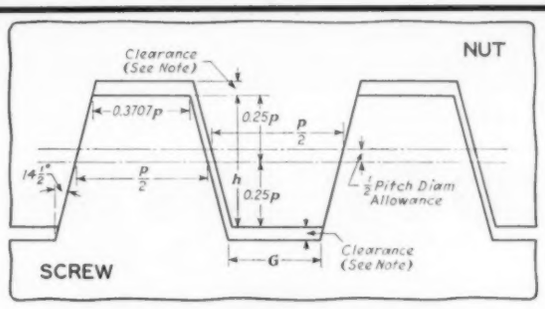


Table 3 General Purpose Acme Thread, Standard and Special Pitches—Basic Dimensions

(Detail dimensions and tolerances for recommended diameter and pitch combinations, see Tables 1 and 2)

Threads per Inch	Pitch	Depth of Thread (Basic)	Total Depth of Thread[1]	Thickness (Basic)	Width of Flat at Crest of Screw (Basic)	Width of Flat at Root of Screw
	p	h		t	F	G
16	0.06250	0.0313	0.0363	0.0313	0.0232	0.0206
14	0.07143	0.0357	0.0407	0.0357	0.0265	0.0239
12	0.08333	0.0417	0.0467	0.0417	0.0309	0.0283
10	0.10000	0.0500	0.0600	0.0500	0.0371	0.0319
9	0.11111	0.0556	0.0656	0.0556	0.0412	0.0360
8	0.12500	0.0625	0.0725	0.0625	0.0463	0.0411
7	0.14286	0.0714	0.0814	0.0714	0.0530	0.0478
6	0.16667	0.0833	0.0933	0.0833	0.0618	0.0566
5	0.20000	0.1000	0.1100	0.1000	0.0741	0.0689
4	0.25000	0.1250	0.1350	0.1250	0.0927	0.0875
3½	0.28571	0.1429	0.1529	0.1429	0.1059	0.1007
3	0.33333	0.1667	0.1767	0.1667	0.1236	0.1184
2½	0.40000	0.2000	0.2100	0.2000	0.1483	0.1431
2	0.50000	0.2500	0.2600	0.2500	0.1853	0.1801
1½	0.66667	0.3333	0.3433	0.3333	0.2471	0.2419
1¼	0.75000	0.3750	0.3850	0.3750	0.2780	0.2728
1	1.00000	0.5000	0.5100	0.5000	0.3707	0.3655

All dimensions given in inches.

[1] A clearance of at least 0.010 in. is added to "h" on threads of 10-pitch and coarser, and 0.005 in. on finer pitches, to produce extra depth, thus avoiding interference with threads of mating parts at minor or major diameters. It is recognized that there are conditions where a greater or less clearance may be desirable.

FORMULAS

p = pitch in inches — t (thickness of thread) = $0.5p$
h (basic depth of thread) = $0.5p$ — F (basic width flat) = $0.3707p$
$G = 0.3707p - (0.52 \times \text{clearance})$
E (basic pitch diameter) = $D - 0.5p$ — K (basic minor diameter) = $D - p$

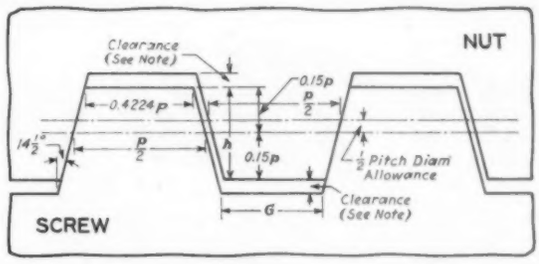


Table 4 29 Deg Stub Thread—Basic Dimensions

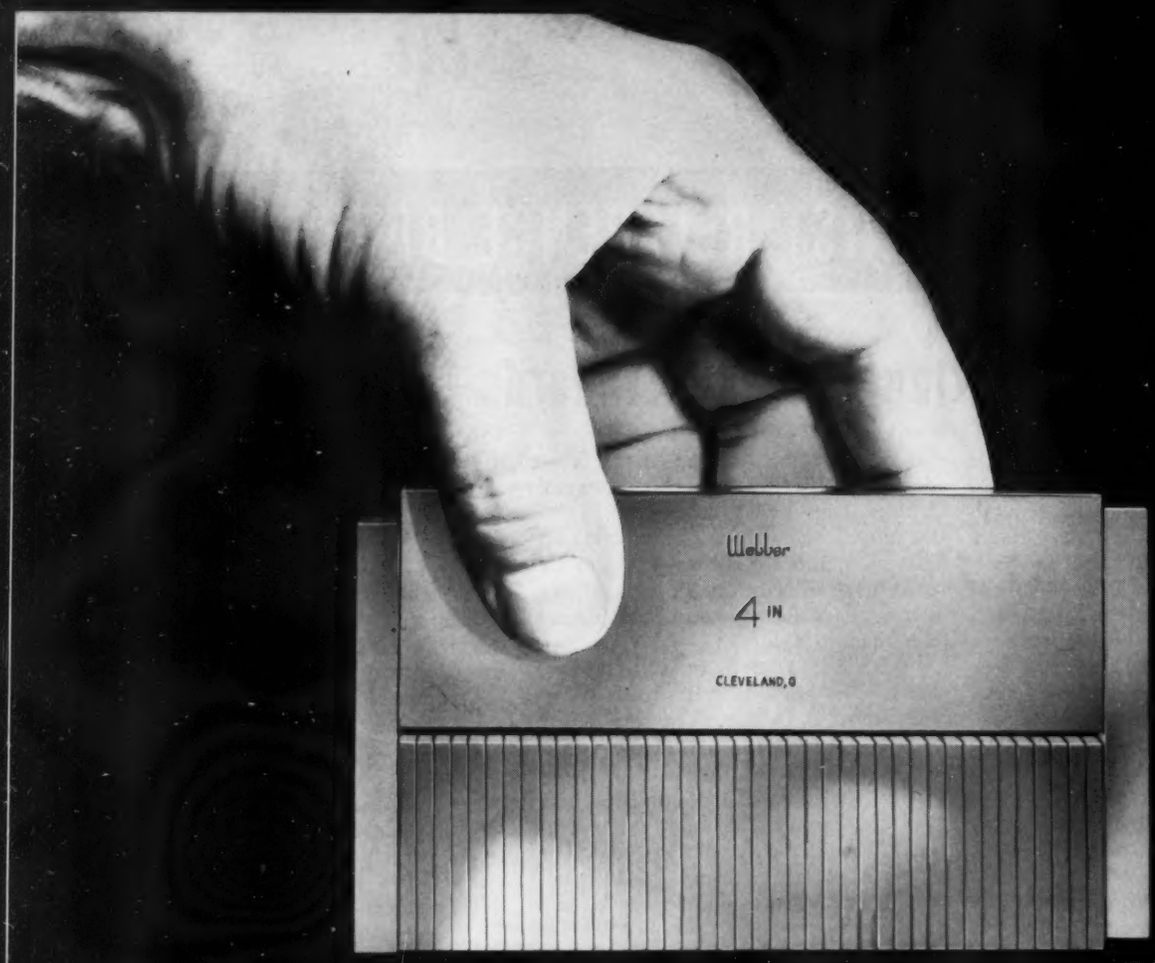
Threads per Inch	Pitch	Depth of Thread (Basic)	Total[1] Depth of Thread	Thickness (Basic)	Width of Flat at Crest of Screw (Basic)	Width of Flat at Root of Screw
	p	h		t	F	G
16	0.06250	0.0188	0.0238	0.0313	0.0264	0.0238
14	0.07143	0.0214	0.0264	0.0357	0.0302	0.0276
12	0.08333	0.0250	0.0300	0.0417	0.0352	0.0326
10	0.10000	0.0300	0.0400	0.0500	0.0422	0.0370
9	0.11111	0.0333	0.0433	0.0556	0.0469	0.0417
8	0.12500	0.0375	0.0475	0.0625	0.0528	0.0476
7	0.14286	0.0429	0.0529	0.0714	0.0603	0.0551
6	0.16667	0.0500	0.0600	0.0833	0.0704	0.0652
5	0.20000	0.0600	0.0700	0.1000	0.0845	0.0793
4	0.25000	0.0750	0.0850	0.1250	0.1056	0.1004
3½	0.28571	0.0857	0.0957	0.1429	0.1207	0.1155
3	0.33333	0.1000	0.1100	0.1667	0.1408	0.1356
2½	0.40000	0.1200	0.1300	0.2000	0.1690	0.1638
2	0.50000	0.1500	0.1600	0.2500	0.2112	0.2060

All dimensions given in inches.

[1] A clearance of at least 0.010 in. is added to "h" on threads of 10-pitch and coarser, and 0.005 in. on finer pitches, to produce extra depth thus avoiding interference with threads of mating part at minor or major diameters. It is recognized that there are conditions where a greater or less clearance may be desirable.

FORMULAS

p = pitch in inches — t (thickness of thread) = $0.5p$
h (basic depth of thread) = $0.3p$ — F (basic width of flat) = $0.4224p$
$G = 0.4224p - (0.52 \times \text{clearance})$
E (basic pitch diameter) = $D - 0.3p$ — K (basic minor diameter) = $D - 0.6p$



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●

Translating Thread Standards—IV

between adjacent sides of the thread measured on the pitch line.

Pitch of Thread. The distance from a point on a thread to a corresponding point on the next thread measured parallel to the axis, $p = 1/n$ (n equals number of threads per inch).

Basic Diameters. The maximum major diameter, D, and the maximum pitch diameter, E, of the screw, and the minimum minor diameter, K, of the nut are basic.

Allowance on Pitch Diameter. An allowance between screw and nut shall be provided at the pitch diameter by making the pitch diameter of the nut larger than basic.

Allowance on Minor Diameter. An allowance between screw and nut shall be provided at the minor diameter by making the minor diameter of the screw smaller than basic.

Allowance on Major Diameter. An allowance between screw and nut shall be provided at the major diameter by making the major diameter of the nut larger than the basic size specified.

Tolerances. (a) The tolerances specified represent the extreme variations allowed on the product.

(b) The tolerances on diameters of the nuts or threaded holes are plus, and are applied from the minimum nut sizes to above the minimum nut sizes.

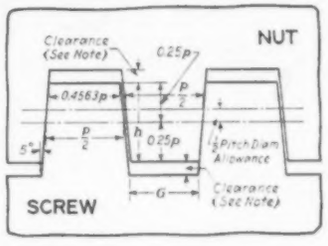
(c) The tolerances on diameters of the screws are minus, and are applied from the maximum screw sizes to below the maximum screw sizes.

(d) The tolerances on the thicknesses of threads are minus, and are applied from the maximum thread thickness to below the maximum thread thickness.

(e) The thread thickness tolerances for a screw and nut of the same diameter and pitch are equal.

(f) The thread thickness tolerances include lead and angle errors.

(g) The tolerances on the major diameters of the screws and minor diameters of the nuts are based upon the pitch of the thread.



Modified Square Thread (10 Deg Included Angle)—Basic Proportions

FORMULAS

p = pitch in inches
*h (basic depth of thread) = $0.5p$
t (thickness of thread) = $0.5p$
G (flat at root of screw thread) = $0.4563p - (0.17 \times$ clearance)
F (basic width of flat at crest of screw thread) = $0.4563p$
E (basic pitch diameter) = $D - 0.5p$
K (basic minor diameter) = $D - p$

* A clearance should be added to "h" to produce extra depth, thus avoiding interference with threads of mating parts at minor or major diameters. The amount of this clearance must be determined from the application of the thread assembly.

NOTE: Multiple thread milling cutters and ground thread taps should not be specified for modified square threads of steep helix angle without consulting the cutting tool manufacturer.

Table 5 Measurements Over Three Wires for Acme Threads When Pitch Diameter Is Basic

Size	Threads per Inch	Pitch Diameter (Basic) E	Diameter Wires	Measurement Over Wires M	Pitch Constant[1]
¼	16	0.218,750	0.03500	0.27324	0.120,835
5/16	14	0.276,786	0.04000	0.33895	0.138,097
⅜	12	0.333,333	0.04500	0.39748	0.161,113
7/16	12	0.395,833	0.04500	0.45983	0.161,113
½	10	0.450,000	0.06000	0.55686	0.193,336
⅝	8	0.562,500	0.07000	0.67106	0.241,670
¾	6	0.666,667	0.09000	0.79496	0.322,226
⅞	6	0.791,667	0.09000	0.91965	0.322,226
1	5	0.900,000	0.11000	1.06369	0.386,671
1 ⅛	5	1.025,000	0.11000	1.18846	0.386,671
1 ¼	5	1.150,000	0.11000	1.31329	0.386,671
1 ⅜	4	1.250,000	0.13000	1.41686	0.483,339
1 ½	4	1.375,000	0.13000	1.54169	0.483,339
1 ¾	4	1.625,000	0.13000	1.79146	0.483,339
2	4	1.875,000	0.13000	2.04131	0.483,339
2 ¼	3	2.083,333	0.18000	2.33866	0.644,452
2 ½	3	2.333,333	0.18000	2.58849	0.644,452
2 ¾	3	2.583,333	0.18000	2.83836	0.644,452
3	2	2.750,000	0.25000	3.03337	0.966,678
4	2	3.750,000	0.25000	4.03265	0.966,678
5	2	4.750,000	0.25000	5.03233	0.966,678

All dimensions are given in inches.

[1] Pitch constant equals $1.933355p$.

FORMULA

$M = (1.871778 \times S^2 + 4.993929) \times$ wire diameter + pitch diameter − pitch constant, where S = tan helix angle

To use larger or smaller wires than in above table: Add or subtract the differences in wire diameters multiplied by 4.9939. (For practical purposes, difference in wire diameters multiplied by 5 will be found satisfactory.)

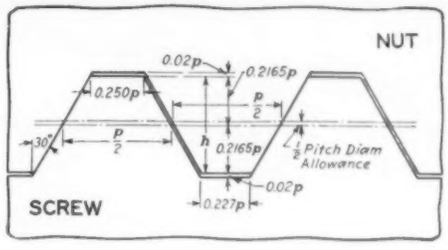


Table 6 60 Deg Stub Thread—Basic Dimensions

Threads per Inch	Pitch	Depth of Thread[1] (Basic)	Total Depth of Thread	Thickness (Basic)	Width of Flat at Crest of Screw (Basic)	Width of Flat at Root of Screw
	p	h	(h + 0.02p)	t	F	G
16	0.06250	0.0271	0.0283	0.0313	0.0156	0.0142
14	0.07143	0.0309	0.0324	0.0357	0.0179	0.0162
12	0.08333	0.0361	0.0378	0.0417	0.0208	0.0189
10	0.10000	0.0433	0.0453	0.0500	0.0250	0.0227
9	0.11111	0.0481	0.0503	0.0556	0.0278	0.0252
8	0.12500	0.0541	0.0566	0.0625	0.0313	0.0284
7	0.14286	0.0619	0.0648	0.0714	0.0357	0.0324
6	0.16667	0.0722	0.0755	0.0833	0.0417	0.0378
5	0.20000	0.0866	0.0906	0.1000	0.0500	0.0454
4	0.25000	0.1083	0.1133	0.1250	0.0625	0.0567

All dimensions given in inches.

[1] A clearance of at least $0.02p$ is added to "h" to produce extra depth, thus avoiding interference with threads of mating part at minor or major diameters.

FORMULAS

p = pitch in inches
t (thickness of thread) = $0.5p$
h (basic depth of thread) = $0.433p$
F (basic width of flat) = $0.250p$
G (flat at root of screw thread) = $0.227p$
E (basic pitch diameter) = $D - 0.433p$
K (basic minor diameter) = $D - 0.866p$

Seasoning for a Batch of Alloy Steel

O E M Photo by Palmer, in an Allegheny Ludlum plant

. . . But Not to Hitler's Taste

WAR'S emphasis is on *strength,* in men and in steel. That trite little truism is all pictured for you above, where the last admixture of alloys is going into an Allegheny Ludlum electric furnace.

In the shortest possible time after the arc is struck, that batch of alloy steel will be war material in use. It may be stainless bomb racks or ammunition chutes; tool steels fashioning a tank; valves or nitrided shafts in engines; electrical steels in gun and engine controls. Whatever it is, Hitler definitely won't like the taste of it. Nor will Tojo.

But let's make sure it takes the least amount of time to turn out these finished war goods. And let's not waste, unnecessarily, a single pound of vital alloys in the process.

To help engineers and production men toward more efficient fabrication and use of alloy steels, and to aid in the instruction of training classes, we have developed a wide list of printed aids. They're especially valuable for assisting "conversion" plants to avoid pitfalls and get under way. Just tell us your alloy steel problems, and let us help you find the answers.

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More and More With Less and Less

THERE WAS a time, not long ago, when we thought that we had too much of everything—manpower, machinery and materials.

Today, contrary to the preachings of years, we are startled by an actual or a potential shortage of all three. We can't make them stretch far enough to do the war job as quickly as we should like.

Of the three vital factors, the most serious shortage is in materials.

That puts squarely upon American industry the job of using every pound of steel, of copper, of aluminum, of all critical materials to the best advantage.

It is not enough for Washington to say to manufacturers of non-war goods that they may no longer employ these critical materials in fabricating their products.

War contractors must not be wasteful of or careless with these materials merely because they can get them and the other fellow can't.

In peacetime it was the habit of many industries, notably the automobile industry, to make every possible saving of materials because it meant lower costs and more profits.

In wartime it should be the habit of every war contractor to make every possible saving of materials for the same reasons as in peacetime—plus a still more important reason. Each pound saved means production of that many more guns and tanks and planes and ships with which to defeat the Axis.

If you can cut in half your rejections of finished war goods, if you can reduce sharply the volume of parts scrapped in process, if you can redesign your product so that less metal is removed by machining, you will have made more materials available for someone else to turn into munitions of war.

At the same time you will be producing just as large a volume as before, and probably more. And you will be doing your job better.

To supply our armed forces "too much too soon," as Donald Nelson (and every loyal American) wishes, *we must produce more and more with less and less.*

Burnham Finney

GAGING BUSINESS

Although records are being broken now, full force of war production will not be felt until later in year. Gliders get top rating priority. Machine tool output nears war ceiling

Though the metal-working shops of the country already are producing a notable volume of war goods the full force of their all-out efforts will not be felt until later in the year. In many cases, they are breaking records now. Toward the end of the year, however, the flow of products out of U. S. metal factories to beat the Axis will assume the proportions of a torrent. Production will be on a scale never before approached in this country or anywhere else.

Machine Tool Rise—Continuing to operate on a longer work-week than any other industry, machine tool builders are pushing their output up to a new peak. Conservative estimates now put the total production for the year 1942 at $1,400,000,000. It is doubtful whether the monthly rate will rise sharply above the present rate, though it is bound to go up some. A limited number of companies are completing plant additions which will be in operation in the near future and will boost the industry's total. But aside from this factor, the industry is up close to its war ceiling. A considerable amount of machine tools are going to Russia and to the British Empire to assist our allies in expanding their production of munitions and of other implements of war. Some war officials in Washington, however, are critical of this policy, believing that it would be much smarter to retain the equipment in this country and ship the finished munitions abroad. They point out that the present system delays the day when maximum war output will be reached here, because tools essential to U. S. production are being shipped elsewhere.

Machine tool builders are continuing to enlarge their working forces, which now total 110,000 people. A number of companies are taking on women workers as the supply of men dwindles. Three shifts have become more common in the industry.

Steel Worries—Steel people are worried about the critical shortage of scrap, which already has reduced operations at certain points. They also are concerned over the sizable shipment of semi-finished steel abroad. Such shipments cut down the steel available for processing into steel products badly needed in this country to carry out the war program here.

Production of structural shapes and steel sheet piling is keeping pace with expanded plate output. More emphasis has been put on getting increased plate tonnage than on any other steel item, because of the heavy requirements of plates for ship construction. Some 6,500,000 tons of plates and 1,500,000 tons of shapes will be used in building the victory fleet of 2,300 ships projected for 1942 and 1943.

Iron ore is moving down the Great Lakes in record volume, partly because of new ore carriers put into service this season. Shipments this year will be greater than ever before in history.

Gears—The sale of industrial gears in June was 24 percent above the same month of last year, according to the American Gear Manufacturers Association. However, sales in June were 12 percent below the previous month of this year. For the first half of 1942 sales were more than 35 percent above the same period in 1941.

Gliders Take Spotlight—Washington is focusing much attention on increased production of glider planes as quickly as possible. Equipment and material for glider manufacture have top priority. This fact is cause for interesting speculation regarding the part that gliders will play in the war effort of the United Nations. Some talk has been heard of the use of gliders for transporting war goods as well as for moving troops.

Plane manufacture, though coming along at a healthy rate, still is handicapped by shortages of materials and of certain parts. Preparations are under way for production in this country of a plane engine of greater horsepower than any now made. It will be the world's most powerful aircraft engine and will be built in large volume.

Special Electrical Equipment Banned—So many customers have specified special electrical equipment for machine tools that machine tool builders have complained that production has been slowed. The War Production Board has issued Order L-147 prohibiting this practice except by special permission of the Director of Industry Operations. After July 15 no orders could be placed for tools with special electrical equipment unless approved in writing by the tools section of WPB. When any machine tool ordered before July 15 has been completed except for special electrical equipment, the builder is to request the purchaser to accept the tool with whatever electrical equipment is available. If the purchaser won't accept the machine on that basis, the builder is to deliver it to the next customer on his schedule in accordance with Order E-1-b. The order does not apply to orders for the Army, the Navy and the Maritime Commission.

Critical Industries—If your industry is on the list of key industries which selective service has released as essential to the war effort, it does mean that those of your employers who fill "critical" occupations can almost certainly get occupational deferment. A list of 138 such occupations has been prepared by the U. S. Employment Service. Employers who are not in critical occupation will nevertheless not be drafted from the key industries until after men of the same marital status have been taken from other industries.

Spending Rises—Total U. S. war expenditures for June were $4,123,000,000 as compared with $3,853,000,000 in May. This represents a daily rate of $158,600,000 according to the War Production Board. The increase in the daily rate over May was 6.3 per cent, which indicates a slowing down of the rate of increase. The daily rate in May was 10.7 percent above April

SWPC Receives Important Emergency Powers

Smaller War Plants Corporation can itself make loans if necessary, can insist that a particular firm be given a particular contract, but is expected to use this power sparingly

WASHINGTON—If you're hoping for help from the new Smaller War Plants Corp. in getting into war work, don't start by coming to Washington. The new WPB subsidiary is just getting going and won't have any facilities for looking after you. The thing to do is get in touch with one of WPB's thirteen regional offices or 120 local offices.

Formation — at Congressional mandate—of the new outfit doesn't offer automatic assurance to little businesses that they'll be taken care of. For one thing, the corporation has only $150,000,000 to work with; for another, there are definite limits to the amount of capacity the war program can absorb.

Donald Nelson says that an important phase of the corporation's work will be to help firms doing non-essential work to shift to essential civilian lines where they can keep going. No one knows yet how this might work.

Beyond this, SWPC's activities are likely to resemble rather closely those of the Division of Contract Distribution, which it supersedes. That is, it will try to get prime contractors and subcontractors together, will stimulate formation of regional production pools of small firms. Difference is that it has important powers available to it when normal procedures break down. If the various war credit plans don't work in a particular case, SWPC itself can make loans or can buy plant facilities.

Power to Compel

Also, SWPC can insist that a particular firm be given a particular contract. It does this by certifying to the Army or Navy that the firm is capable of taking the job. If the services still don't act, SWPC can compel them to grant the contract to SWPC Pitself and then subcontract it to the firm in question. It's certain, though, that SWPC will use this power sparingly. Any firm that was granted a contract against the will of the contracting agency would really be on the spot when the time came to inspect the goods.

The membership of SWPC's board of directors, selected by Nelson, includes seasoned men who know what it takes to line up a war job for their shops or for a pool. Lou E. Holland, Nelson's deputy chairman on SWPC is a pioneer in plant pooling. In July, 1941, he organized Kansas City's mid-central Associated Defense Industries, Inc., a pool of 32 concerns to get a bite of war work. William S. Shipley, board chairman of York Ice Machinery Corporation, was the moving spirit in the York plan, first of the war work pools. James T. Howington of Louisville, Ky., left a vice president's job in the Girdler Corporation last September to become district manager of WPB's field office in that city. Albert M. Carter is a small town banker (Murphysboro, Ill.) and president of a small kaolin mining company near Annal, Ill. Samuel A. Smith was president of the Thomas Strahan Co., a wallpaper manufacturing firm in Chelsea, Mass., and vice president of the active Smaller Business Men's Association of New England.

Pay Rise for Little Steel; Stabilization Breaks Down

WASHINGTON—Award by the War Labor Board of an extra 44c a day to the Little Steel workers is final evidence that wage stabilization through the present semi-voluntary machinery has broken down. Union security and the check-off are hard for the steel companies to take, but these have become pretty standard features of WLB decisions—having no immediate affect on production or inflation, whatever their long-range importance.

But short of positive and powerful action from the White House, there's now little doubt that wages will continue a steady upward movement, pushing prices ahead of them. Inflation is definitely in the air. The administration's anti-inflation program has been pretty well stymied by such developments as the steel wage decision, the timid tax bill, farm price protection, obvious Congressional hostility to the office of Price Administration.

No Pressure on Congress

There's still a possibility that Roosevelt will make another try, will ask Congress for a really tough all-inclusive price control law. But, as of mid-July it seems unlikely that FDR will take the risks to war production and to his political position involved in putting the kind of pressure behind such a bill that would be required to get it through Congress.

Best indication now is that the administration has resigned itself to a substantial degree of inflation, will concentrate its efforts on two things: (1) slowing the inflationary movement where possible. Thus steel workers get 44c instead of a dollar; price ceilings are raised but not removed. (2) Guiding the inflation in what it considers socially desirable directions. Traditionally, labor is the big sufferer from inflation. But if the brakes on wages can be kept looser than those on other kinds of income, labor's real earnings will drop less than that of others.

Here Comes the M-4—Topped by a 75-calibre gun mounted in the revolving turret, the new medium tank is built low, with the usual angles eliminated. It is a more difficult target to damage. The hulls are of cast or welded construction. The new design is the result of battle experience with the M-3

Australia Develops New Products, Processes As Every Available Resource Is Utilized

NEW YORK—Australia needs materials to do her share towards winning the war, but before asking for outside help, she has utilized every resource at her command. The manufacturing status of the Commonwealth was described by L. H. Hartnett, Australian Director of Ordnance Production, who recently arrived in this county. Before the war Mr. Hartnett was managing director of the General Motors Corporation in Australia. In addition to his ordnance duties, he is a director of the Commonwealth Aircraft Corporation.

Some idea of the magnitude of Australia's job may be obtained from the fact that its area is almost the same as that of the United States, whereas its population is less than seven and a half million. The Commonwealth has only about 1,200,000 men between the ages of 19 and 35. The scarcity of manpower is further aggrevated by the fact that a higher percentage of men are under arms than in any other country.

Fighting the War of the Workshops

Australian procedure differs from that in this country in that the armed forces dump their demands into the laps of the ordnance section instead of supervising practically every phase of the manufacture of ordnance products.

With major manufacturing experience going back only 20 or 25 years, Australia has pitched in to do its share in winning the "war of the work shops." Its steel industry, a government-regulated monopoly claims to have the lowest price per ton of any producer in the world. War demands have caused Australian mills to turn out a wide variety of alloy steels in sufficient quantity to meet the Commonwealth munitions program. Zinc and lead are plentiful, while copper and tin are available in limited quantities. The bauxite deposits on the island continent have not yet been extensively developed, although an aluminum fabricating plant is in operation.

Australia's late entry into the industrial field has directed its developments into new products and new processes. For instance, it produces die castings, plastics, steel and copper wire in good quantities, whereas some of the older, heavier industries are not maintained in the balance found in other countries.

Produced Small Arms in Last War

The Commonwealth steel industry dates to the last World War when it was created through necessity. During that period Australia also started the manufacture of rifles and Vickers machine guns on a limited scale. The Pratt & Whitney Company was helpful at that time in lending technical assistance, and furnishing equipment for the small arms plant.

From this small beginning Australia's arms industry has made sizable strides which have naturally grown longer by the start of the present war. Inserted in the present production program are such products as the Bren gun, Lewis gun parts, 3.7-in. anti-aircraft guns, 3-in. 20-cwp. anti-aircraft guns, Bofors 40-mm. anti-aircraft guns, two-pounder anti-tank guns, 25-pounder howitzers, the Vickers predictor, and quantities of ammunition for small arms, artillery and bombs.

The fall of Crete under the impact of enemy air-borne troops brought home to Australia the vital need of sub-machine guns. It entered manufacture promptly on the Owen gun, the design of one of its own engineers. The much publicized Sten, the $8 gun manufactured in Breat Britain, is now also a product of Australian factories. This gun is known in the Commonwealth as the Austen, and is made at a cost comparing favorably with that of the British counterpart. The gun violates traditional design by substituting for the extensive use of forgings components of drawn tubing, stampings and die castings.

Optical Industry Growing

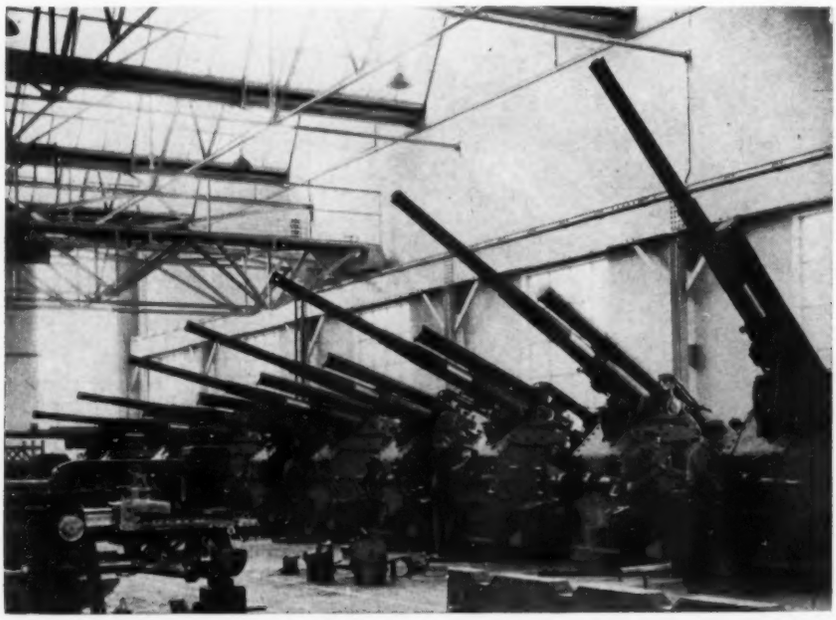
Another notable advance has been the development of an Australian optical instrument industry, which includes the production and finishing of optical glass, as well as the instruments themselves. Australia makes all its own grinding, finishing, lapping and polishing machines for this work.

One war stringency which affects Australia directly is in shipping. Mr. Hartnett stressed the need for more ships and for consideration of ease of stowage in designing war products. Aircraft and other products tend to be bulky and waste cargo space unless they can be readily dissembled for overseas shipment.

Directed by Ministry of Munitions

Australian war production is guided by a ministry of munitions, which consists of directors for each of the following activities: explosives, machine tools and gages, ship-building, ammunition, ordnance production, aircraft materials, technical education and finance.

The Ordnance Production Division of the Australian War Supplies Procurement Organization will be represented in this country by Alfred Mealand, 25 Broadway, New York City, who is director of machine tool procurement. Mr. Mealand is especially interested in securing catalogs and notices of shop equipment as an aid to Australia's part in the war effort.



Production "Down Under"—These 3.7-in. anti-aircraft guns are being produced in one of Australia's armament factories. These guns are completely Australian made and are equipped with Australian-built predictors

EQUAL PAY FOR WOMEN?

LONDON—The Amalgamated Engineering Union has decided unanimously that women must be admitted into industry on equal terms with men. A conference of the union called on members to give the maximum assistance to equip women to become efficient workers. This gesture, by such a powerful union, marks a historic step in the progress of women towards complete equality in the industry and in the trade union movement.

More Pressure Put on Increasing Aircraft Production

Leveling off in new plant construction does not apply to aircraft plants. Miracles performed, but much higher output needed; contest between aircraft and auto industry

WASHINGTON—Leveling off of war production expansion does not apply to airplane plants. Most recent of the War Department's deficiency appropriations calls for more than $100 million for still more aircraft production capacity.

Some weeks ago it was semi-officially stated that aircraft plants operating and in preparation totaled about 30. Now it can be said there are between 40 and 50 in the whole program.

Yet informed officials who want to be strictly honest with the public say we will have to put on still more pressure if we produce the 7500-per-month average necessary to total 60,000 this year.

Many authorities who know the facts hesitate to reveal them because it will please the enemy. But others believe that puffing up aircraft figures harms the American public still more.

Airplane production is an "industrial miracle", but the public should not be led to believe it is enough or that it could not be better.

Much depends of course upon the automobile industry. We are not told what portion of it is devoted to aircraft and engines but it's large.

A contest is developing between the "old-line" aircraft industry, and the aircraft-auto industry. This would be all to the good if it was all in terms of production. But a great deal of it is words.

The old airplane people do not want to fight because they know the bigger auto boys could steamroller them. The Aero Chamber of Commerce refers to itself as the "old line" industry. It feels that its members have a long lead in aircraft "know how." The Automotive Council for War Production has made statements that appear extravagant in the light of facts.

For instance the "plane per hour" promised from the Ford Willow Run plant doesn't match up with figures of the War Production Board. A plane an hour means 24 a day in plain English. If you put the promise on the basis of an eight-hour day it might be nearer right. It is estimated from all the available information, that this plant will reach its maximum output of Consolidated B-24s about the middle of next year.

Difficulties on Make-Ready

The automobile industry is having serious difficulties with its airplane make-ready, and that was to be expected. For example, the Willow Run plant has not yet produced one plane out of its own parts, and will not, for some weeks. Yet when the jam is broken, the whole flood will come down the assembly line. Though this plant is temporarily behind schedule, doubtless the Council's statement is true that it will build heavy bombers faster than all the Axis countries combined.

Seven former auto builders are already producing airplane engines (Chevrolet, Studebaker, Chrysler, Packard, Ford, Allison, Buick) and two others are getting ready.

Six auto companies are said to be building complete airframes. Complete planes including engines and propellers, are built only by parent companies like United Aircraft and General Motors.

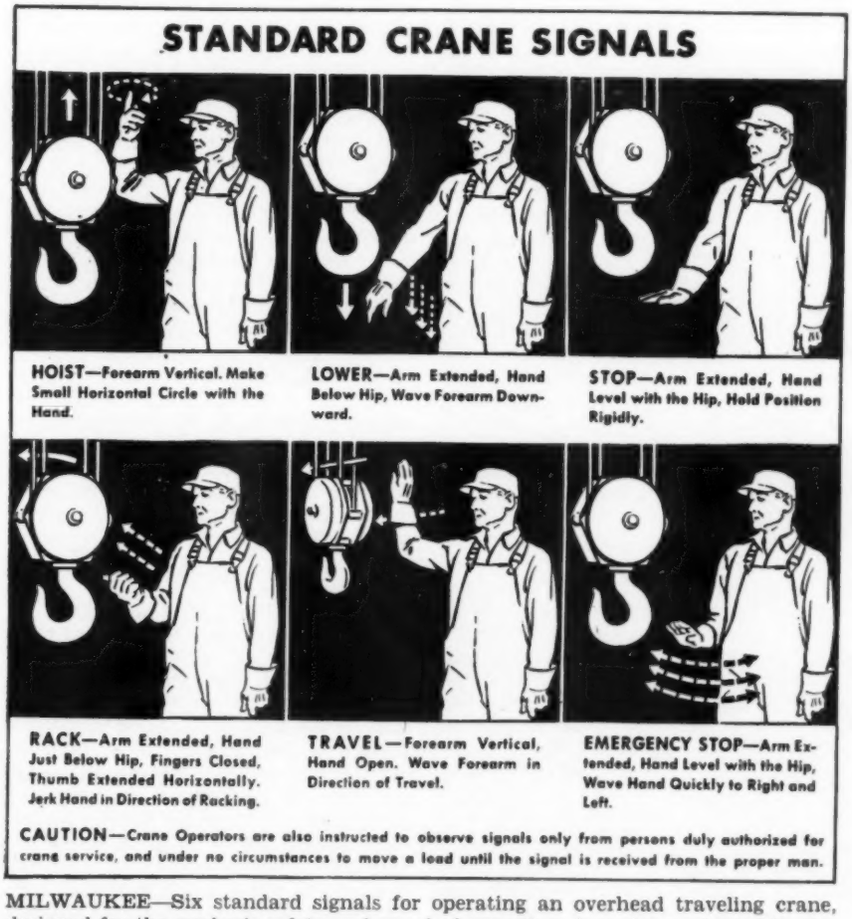
A network of auto body plants, all around Great Lakes and the Mississippi Valley (including subcontractors) is making subassemblies for North American B-25 medium bombers.

WPB is immensely pleased with most of the auto-planes operations. In fact, some "old line" airplane people think WPB is favoring the newcomer auto element. This of course is not so. Highest off-hand words of praise, coming from a WPB airplane official were for Buick, making Pratt & Whitney engines, and for Boeing, making B-17s. Both are going "great guns," far ahead of their schedules.

How Good Are American Planes

Controversy over quality of our pursuit planes goes on. The Chief of Air Forces in hearings defended American pursuits by detailing victories. He even quoted a British pilot to the effect early P-40s are equal to the Messerschmitt 109F.

But some independent critics still insist that the Messerschmitt, the British Spitfire, and the Jap Zero will remain superior until we get the new Vought Navy fighter and the Republic 2000 hp. P-47 into mass production. There is no question of the equality of our heavy and medium bombers, dive bombers and other types. Use of medium bombers, specifically the Martin B-26, as torpedo planes, is confirmed by both Army and Mr. Martin.


STANDARD CRANE SIGNALS
HOIST—Forearm Vertical. Make Small Horizontal Circle with the Hand.
LOWER—Arm Extended, Hand Below Hip, Wave Forearm Downward.
STOP—Arm Extended, Hand Level with the Hip, Hold Position Rigidly.
RACK—Arm Extended, Hand Just Below Hip, Fingers Closed, Thumb Extended Horizontally. Jerk Hand in Direction of Racking.
TRAVEL—Forearm Vertical, Hand Open. Wave Forearm in Direction of Travel.
EMERGENCY STOP—Arm Extended, Hand Level with the Hip, Wave Hand Quickly to Right and Left.
CAUTION—Crane Operators are also instructed to observe signals only from persons duly authorized for crane service, and under no circumstances to move a load until the signal is received from the proper man.

MILWAUKEE—Six standard signals for operating an overhead traveling crane, designed for the worker's safety and speed of operation, have been adopted by the Harnischfeger Corp., which it is distributing on cards suitable for wall hanging. The signals are simple and easy to remember, and will take but a few minutes to learn. The illustration shows the "sign language" and explanation.

Hiding the Horizon—Light beams are bent below the horizontal level at the shipyard of the Federal Shipbuilding and Dry Dock Company. This reduction of sky glow is effected by wide rimmed visors which have been installed throughout the yard

War Production Fund Conducts Campaign to Reduce Accidents

NEW YORK—A safety campaign to reduce accidents is being conducted by the War Production Fund to Conserve Manpower of the National Safety Council. Assisted by representatives of the country's business and industrial interests W. A. Irvin, former president of the U. S. Steel Corp., is national chairman of the Fund. With millions of workers being shifted to new jobs and new machinery, hazards multiply everywhere. Thus our war effort and economy are being seriously affected.

Illustrated pamphlets and safety instruction cards are being distributed to drive home the "dos and don'ts" to workers in this drive for safety.

During 1941 frequency of accidents in the machinery industry increased 17 percent and severity 7 percent in comparison with the 1940 rates. These results compare unfavorably with an average increase of 8 percent in frequency and an average decrease of 8 percent in severity for all industries, according to reports of the National Safety Council.

The principal unsafe acts in serious accidents were: (1) working on moving machinery, (2) using hands instead of tools, and (3) gripping unsecurely, lifting improperly or otherwise handling objects unsafely.

Promotions in Tools Section

WASHINGTON—Albert M. Stedfast, Stedfast & Roulston, and first vice-president of the Associated Machine Tool Dealers of America, has been appointed Assistant Chief of the Tools Section of the War Production Board. Benjamin H. Bickle, Gleason Works, received a similar appointment. Both have been connected with the Tools Section for some time. No changes in policy are contemplated.

Canadian National Selective Service Will Reallocate Workers to Vital War Production

Washington will provide the capital for sub-marginal mining of metals in Canada

OTTAWA—Within a few weeks National Selective Service Director Elliott M. Little will call in representatives of various groups of non-essential industries and tell them that Canadian war industry must have a specified number of their workers. As far as possible he will leave it to firms in each industrial group to determine among themselves how many workers each is to give up. In some cases where he considers a firm is serving no particular national purpose he may make a direct demand for its workers. So far compulsory methods of recruiting war industry labor have been avoided but will be resorted to as the situation tightens.

Present estimate of manpower requirements for the combatant services and war industry is 250,000 over the next five months. Little admits that procurement of this number will involve closing down of some civilian plants. Best way for a civilian industry in Canada to assure its survival is to find some war work to do. Many are not equipped for this.

Unemployed Women Will Register

A recent inventory of male unemployment in the country produced a total of approximately 80,000 jobless, of which 60,000 are wholly or partially employable. At least 190,000 are needed from among workers with jobs to meet needs of the armed services and war plants. Little will start soon a registration of unemployed women and from among these some of the requirements of war industry will be met.

Increasing scarcity of materials required for both war and civilian industry will also curtail operations among the latter. To conserve more of such materials for war purposes Departments of Munitions and Supply has adopted intact Washington's War Production Board allocation classification system requiring the use of symbols to identify the ultimate purpose for which all materials are bought. All firms except retailers placing orders amounting to $15 or more must identify themselves with an appropriate symbol according to their classification.

Symbols Same as U. S.

To give effect to the Washington-Ottawa agreement providing that Canadian war plants are to be treated on a basis of equality with U. S. plants in the allocation of scarce materials of U. S. origin, the purchaser of goods for use in connection with Canada's armed forces will use the same symbol as the purchaser of goods for U. S. armed forces. For the Canadian army and air force the symbol is "USA" and for the Canadian navy it is "USN."

Many months ago Canadian metals controller George Bateman assured Washington that Canada would not seek from the U. S. mining equipment not required for essential production and at the same time he warned gold and silver mining companies that in keeping with that undertaking they must not expand their operations in a way to make further demands on equipment resources. Now, largely because one or two gold companies disregarded that instruction and sought equipment for expansion below the border, to the prejudice of Canada's good faith, all Canadian mining companies are being placed under license to Bateman. At the same time gold and silver companies are limited in production to the average of the first four months of this year.

Closer Control of Mining

But another purpose of the licensing is to give Bateman closer control of mining operations to increase production of strategic minerals, particularly under the agreement whereby Washington will provide the capital for new marginal and submarginal developments, the production of which will go to the United States. Bateman is to act as the representative of Reconstruction Finance Corporation for this financing. He will determine what properties are to be developed and make the contracts with the individual companies undertaking the developments. Subject to the approval of R.F.C. he will fix the terms of the contracts. Capital advances from R.F.C. are to be repaid out of the proceeds from the sale of output to the U. S. The percentage of the proceeds to be devoted to repayment will be specified in each contract. Repayment obligations are to be considered discharged when the war emergency terminates.

Method Used Reluctantly

It is understood here that both U. S. and Canadian officials would have preferred to ensure such marginal and submarginal developments in Canada to meet strategic metal needs of the U. S. by the method employed by Washington in the case of U. S. mineral developments—that of paying a price premium on the output of low-grade operations. This would have avoided the necessity for U. S. government financing of developments in Canada. Washington officials, it is reported here, turned reluctantly from this method because it might lead to complications in connection with the procurement of similar types of supplies from other countries.

INSIDE DETROIT

More than half the new workers in Detroit munitions plants must come from ranks of housewives. Voluntary registration of women pushed. Average weekly pay check now $50.29

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—From now on munitions makers in Wayne County and nearby communities must draw from one-half to two-thirds of new employees, if possible, from the ranks of housewives and other women who are not normally a part of the labor pool.

What Detroit faces in the way of a labor shortage may soon follow in other communities. Arms plants in the area are now employing well over 550,000 people (more than auto plants did in June, 1941). By August, the immediate supply of resident male labor will dwindle to 15,000. In-migration of labor must go on, but it can not be allowed to assume large-scale proportions because housing facilities are available for only 75,000-80,000 more people, and then mostly for single persons.

Hiring must proceed at an average rate of 22,000 persons per month through November if local arms plants are to keep on schedule. In-migration and releases of males from non-essential manufacturing and service occupations may provide a substantial portion of requirements.

But after counting noses from all sources, including women who can be induced to leave homes for factories, the labor shortage in November is still estimated by planning bodies at 56,000. Labor economists have estimated that 80,000 women are available. Thousands of patriotic and perhaps curious women have already besieged the U. S. Employment Service and factory personnel offices in search of war jobs. Those with potential value and genuine interest have been referred to the Detroit vocational education system, which is now providing pre-employment training to about 3,000 women at a time. Exigencies of the employment outlook, however, require positive methods of insuring an orderly flow of women into arms plants, perhaps at the rate of 10,000-15,000 per month.

Women Will Register

By agreement of all parties concerned—government agencies, employers and labor—the U. S. Employment Service has been selected to conduct a voluntary registration of all women over 18 throughout the Detroit economic area. With approval of the Post Office, cards will be delivered to approximately 650,000 women around the middle of August. Air raid wardens will probably visit homes to explain reasons why registration is a patriotic necessity, and radio and newspaper publicity will support that theme.

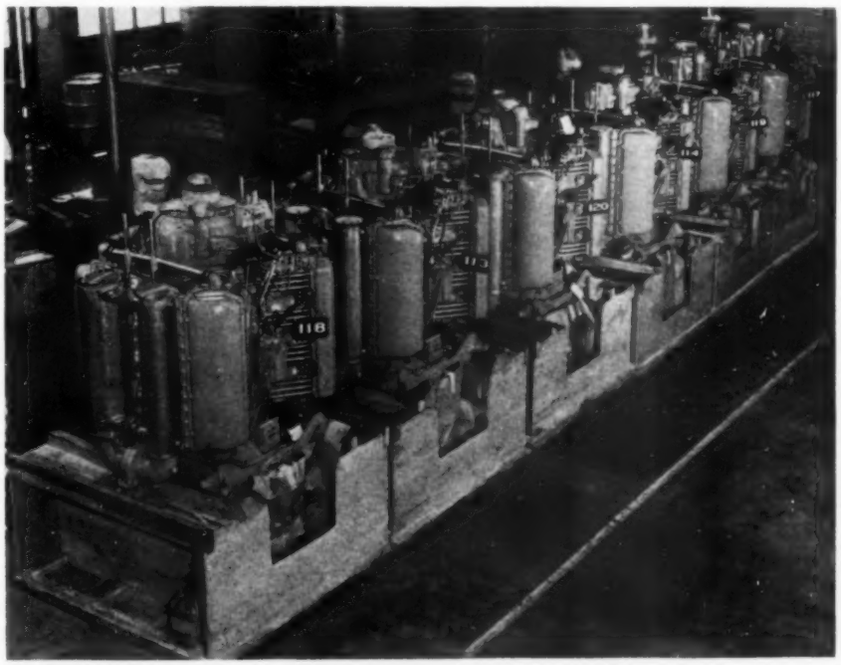
One half of the registration card will explain the reasons why the card has been sent, the other half is to be filled in and returned to the U. S. Employment Service with free franking privilege. Women will be asked to state whether they are employed, and, if so, by what firm and their responsibilities. This feature has been added to the card so that the government can decide whether the registrant is actually employed in war work or not. In other spaces the registrant will indicate whether she is willing to take a war job, status of dependent children and probabilities of adequate care in her absence, and what sort of clerical or industrial experience she has had, if any.

The U. S. Employment Service was selected as the proper agency to conduct the registration of women and supervise despatch of applicants to war plants as a means of avoiding duplicated effort by factory personnel offices. Women who want war jobs will be called in for interviews after matching employer requirements with experience records. Pre-employment training will be offered to many women, but bulk of the training load will probably be handled by manufacturers. Efforts will be made to minimize the amount of travel between the housewife's home and place of work.

The War Manpower Commission, of

FISHER BUILDS BORING MILLS

DETROIT—When Fisher Body undertook production of tanks, one of the major problems confronting it was the acquisition of vertical boring mills. These machines had to be of unusually large size for armor plate machining. Previous tank production had exhausted the available supply. In collaboration with outstanding machine tool makers of such mills, a large and sturdy machine was designed especially for tank work. Production of the machines was started by Fisher Body on a basis whereby it could fulfill all its own needs plus those of several other tank builders as well. In normal times a comparatively few boring mills were built in an entire year. Last week Fisher Body turned out more of them in seven days than would have been considered possible six months ago.



Pancake for Subs—These high-speed, high-horsepower, light-weight Diesel engines are being built by the Electro-Motive Division of General Motors. Dubbed "the pancake," it occupies about one-third the space of best previous engines of this rating

which the U. S. Employment Service is an agency, has decided to extend registration of women to other arms producing centers. But results obtained in Detroit will be closely watched for results and indicated changes in method.

In speaking of the employment of housewives, E. C. Kanzler, regional director of the War Production Board, told AMERICAN MACHINIST that treatment of mothers might be patterned after experience in Bridgeport, Conn. In that arms-producing center, mothers with dependent children are hired last, and only if satisfactory arrangements can be made for care of their children. Plant personnel managers make it a point to go into this subject with the mother applicant, and to give her a choice of shift.

Appeal to Patriotism

Women are certainly no strangers to Detroit's auto plants, where for years they have operated machines, worked on small sub-assemblies. Yet on the whole, Detroit has been well below the average city in respect to hiring women for manufacturing jobs. The ratio has been about one woman in ten workers as compared to one in four or five manufacturing employees on a national basis. This situation calls for two programs: (1) an appeal to the patriotism of women living in homes where the breadwinner is receiving Detroit's high wage scale, and (2) a considerable "re-engineering" of jobs so that women can handle many operations safely and within the prescribed state regulations.

Result of Nelson's Speech

Donald Nelson's appearance as principal speaker at the first annual meeting of the Automotive Council for War Production had several important results. The 1300 automotive executives present appreciated the fact that Mr. Nelson had written his own speech and had skipped a Cabinet meeting to be present. They liked his quiet charm and ability, and they gave his good sportsmanship a tremendous ovation. Several times during the evening Gen. Knudsen (Detroit's own and beloved Bill Knudsen) had received great applause. Nelson paid Knudsen a genuine tribute for laying the groundwork upon which a successful war-production effort can be laid, and did it in such terms that any lingering doubts or antipathies toward Gen. Knudsen's successor were entirely blown away.

After going off the air, Mr. Nelson drove home the fact that we have been a wasteful nation, and that he looks to the automotive industry for leadership not only in production but in conserving materials and making "more and more with less and less." He cautioned against hoarding and asked for: (1) orderly scheduling of materials against production needs, (2) every possible means be taken to avoid scrap in production, and (3) unavoidable scrap be kept moving back to converters.

High Wages

To the argument over the need for increasing wages of General Motors, Chrysler, and Ford employees, by $1.00 per day to compensate for the rise in living costs since contracts were written, the U. S. Bureau of Labor Statistics tosses in some figures on how overtime rates and high pay rates for skilled workers have advanced the average weekly pay check to $50.29, a new high.

This dollar figure compares with $40.61 a year ago and with $30.87 three years ago. In terms of real earnings—actual purchasing power—the advance amounts to 40 percent over 1939, despite rising living costs. Wages have more than kept pace with the uptrend in the price of food, shelter and clothing.

The. B.L.S. statistics are conservative, says the Automotive Council for War Production in its publication "Automotive War Production," inasmuch as the new war plants being operated by automotive companies are not included in the study. Including these plants, the average weekly wage in the industry (during April) totaled $54.37; May figures rose to $54.89.

Since Pearl Harbor, the figures show, average weekly wages have increased $9.32 while the cost of living has jumped only $6.55 a week.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

AUTOMOBILE PARTS — Blanket order governs production of spare parts and imposes rigid restrictions on inventories. (Supersedes Limitation Orders L-35, L-4, L-4-c.)

CHROMIUM—This allocation order has been extended indefinitely. (Amendment 3, Preference Order M-18-a.)

COPPER—Pending issuance of an amended order the original order has been exended to July 31. (Extension No. 1, Preference Order M-9-a.)

DIAMOND DIES—Used in drawing wire essential in making electrical combat instruments, have been placed under complete allocation control. (Conservation Order M-181.)

ELEVATORS—Rigid control over manufacture and delivery of equipment and certain types has been established. (Conservation Order L-89.)

HEAT-RESISTANT STEELS—Maximum specifications for heat-resistant alloys used in metallurgical furnaces, oil refineries, synthetic rubber plants, cement mill furnaces and power plant equipment have been set up. (Supplementary Order M-21-g.)

IDLE INVENTORIES—Many thousands of tons of critical materials now frozen will be freed for vital war production. (Regulation 13.)

MACHINE TOOLS—Production of tools calling for special electrical specifications has been prohibited. (Order L-147.)

METAL SHELVING—No orders for this product may be accepted by manufacturers except on specific authorization of WPB. (Amendment 3, Order L-13-a.)

PLASTICS MACHINERY—Specifically defined restrictions on production and delivery of new plastics molding machinery are imposed by provisions of the order. (Limitation Order L-159.)

STEEL DRUM COATING—To enable these manufacturers to use the drum coating on hand, originally forbidden, an amendment has been issued. Application of order is limited to drums made of 29 gage or heavier. (Amendment 1, Conservation Order M-158.)

THERMOPLASTICS—A ladder of uses to govern the distribution of all types to all users has been set up. (Preference Order M-154.)

TIRE MACHINERY—All production and delivery of this machinery and equipment has been prohibited without specific authorization. (Limitation Order L-143.)

TRAILERS—Passenger trailers apply also to order stopping production. (Amendment 1, Supplementary Limitation Order L-1-G.)

TUNGSTEN — Further allocation and end-use control has been placed on this material. (Amendment to Preference Order M-29.)

Birth Certificates Die

WASHINGTON—A new procedure has been developed jointly by the Army and Navy, U. S. Employment Service and the War Manpower Commission which will not require a person seeking a job in a plant working on government contracts to produce a birth certificate to prove his citizenship. Because many states did not require birth registration until recent years, and in others records have been destroyed or lost, much time has been lost in obtaining the required certificate before a person could secure employment. The procedure adopted calls for merely a simple declaration that the applicant for a job is a citizen. However, this declaration must be signed by the worker in the presence of an Army or Navy district procurement, factory or plant protection representative. The penalty for misrepresentation may be as much as $10,000 fine, or five years imprisonment or both.

WARTIME WASHINGTON

Axis fears U. S. power, is trying to crush Russia before it is fully felt. Battle between Army and WPB over raw materials behind recent changes; Nelson holds authority

BY BLAINE STUBBLEFIELD

WASHINGTON—In so far as even the experts can anticipate the turns of war they expected the current desperate victories of the enemy. The Axis sees the vast superiority of Allied population and steel piling up in a potential avalanche that will bury them out of sight in time. While they are standing up, though their heels are down, slugging it out with their immediate foes, they see the United States, a bigger and better man than any of them, just warming up in a corner and still to be taken on. It's enough to make anybody fight, and that's what the Axis is doing, with a will. Our war leaders are not surprised; they are only appalled to see the death and damage that must be inflicted. And they know that if the Nazis could reduce Russia and quiet Europe, they could stand an indefinite siege, stalemate the war and withhold victory from the United Nations for years. It is very serious business.

Behind the WPB Change

You've read in the newspapers that the Army and the War Production Board are having a knock-down-and-drag-out fight. You've probably read that Army wants to take over the whole WPB and then run the country itself.

It wasn't that exciting. Only a half dozen top men in Washington know completely what went on. But basically it appears to have been a dispute over the supply of raw materials. The Army resents Donald Nelson's world-wide total-economy approach to distribution of materials. It has been slapped down by Donald Nelson and FDR. And the generals are still smarting.

The issue came to a head during the WPB reorganization, but actually had only a more or less accidental connection with the mechanics of that shift.

Army officials bitterly resent the necessity of debasing armament standards to save materials—such moves as elimination of rubber from tank treads. They resent the possibility of delays arising from requirements that war plants operate on hand-to-mouth inventories. They feel that before such drastic steps are taken there should be deep cuts in the large shipments of materials to Britain and Russia and in the continued allocation of material to essential non-military uses.

Faced with military lack of confidence in his policies, with some lack of cooperation, Nelson went to the White House. He came away with an assurance of continued presidential support—an assurance that took concrete form in an "OK—FDR" on the draft of the reorganization plan.

The Nelson victory is good news for businessmen, who will welcome reassurance that the nation's production machine will keep getting the essential minimum of maintenance. But this is not an irrevocable decision. The services have not yet said Uncle. They will fight on specific issues. And Army officials still plan to go to the President with the argument that Nelson's priorities system is inefficient and is responsible for materials shortages.

Moreover, a changing production and strategic situation could alter the whole approach.

Today, with monthly war expenditures of just over four billions, we are producing armament at roughly half the peak rates of next year. And we are already squeezed for materials. The situation is not quite as bad as it looks. About a quarter of current expenditure is for productive facilities, work which is rapidly tapering off.

And there is disguised slack in the materials supply. Primary extraction of raw materials now will show up in output of finished goods about six months from now. And present extraction rates are sufficient to support a six billion-dollar effort in six months.

Nevertheless, the situation is bound to be terribly tight next year, when we hit a seven billion a month peak. And at that time a basic strategic decision may have to be made. It may look then as though one supreme push could end the war. In that case, even the barest maintenance of the civilian economy will be stopped and everything be devoted to armament.

On the other hand, it may look like a long war. In this case we might actually cut back arms output in order to expand materials production and strengthen the basic economy for the long haul.

Raising the Scrap Ante

Builders of airplanes and ships say yes, of course we could build 10,000 cargo planes—of course we could outrun submarine sinkings—if we had the materials and the men.

WPB's Conservation Division calls for a steady flow of scrap of all kinds to cover the bottom of the barrel. If you don't ante all your scrap, one of 12,000 committees will soon come in and want to know why.

Few people realize that about half of our great steel and iron production is scrap turnover. In 1941, 82,500,000 net tons of steel ingot required the use of 44,600,000 tons of scrap. An additional 17 million tons of iron and steel scrap was consumed by iron foundries and blast furnaces in making pig and other iron products.

Aberdeen Ack-Acks—These 90 mm. anti-aircraft guns at the Aberdeen Proving Ground can be operated manually or by remote control. The girls testing the control devices are part of a group of 1000 women now engaged in test work at Aberdeen. In the event of an enemy attack the girls would probably man the guns

Stanley Plan Extended Throughout Region; Co-Ordinated With Three Other Activities

CHICAGO—Use of the "Stanley Plan", with its weekly *Directory of Contract Opportunities,* listing jobs according to an alphabetical code showing class, type, and size of machines required, has been extended throughout the Chicago Region to include Illinois, Indiana, Iowa, and Southern Wisconsin. This extension results from a ten weeks' test in Chicago (*AM*—Vol. 86, pages 354j and 466j).

During the test the directory went to 5,000 manufacturers, at first only to those who had heard the plan expounded in lectures; since June 26 it has been going to 15,000.

Jobs Quickly Placed

Joseph L. Overlock, Chicago Regional Director, reports that, "We found that the *Directory of Contract Opportunities* had enough merit to make it worth while to increase our coverage in the region."

Over 60 percent of the parts jobs listed in the directories from April 20 to June 22 were quickly placed—1,043 out of 1,732. Many favorable letters were sent in by contractors who had placed either bottle-neck or production jobs through use of the directory and by sub-contractors who had previously hunted in vain for war work, but had gotten work through the Directory.

A count of the machines listed in fine print in the code used in this plan shows that it covers, by three letters for each machine, 25 classes, 313 types, and 3,124 sizes and variants; yet contractors and sub-contractors say it is easy to work with.

One of Mr. Overlock's objectives in making coverage of the Stanley Plan directory region-wide is co-ordination with three other activities of the district offices: (1) Issuance of *War Production News,* another weekly, containing besides other features a section headed, "Sub-contractors Wanted", which gives brief general descriptions of numbered jobs available for unnamed contractors; (2) Continuous office exhibits of parts for which contractors are seeking sub-contractors; (3) The "War Production Caravan", a truck with two trailers of similar exhibits, which tours through the region. Beginning July 27 the Chicago Regional office will consolidate its *War Production News* and the *Directory of Contract Opportunities.*

Plan Intra-Regional

Of the first 102 Army and Navy contractors who have listed jobs in the directory, thirteen were manufacturers in parts of the region outside of the Chicago industrial district. Moreover seventeen were from outside the region. Thus, while the main use of the plan is and will be intra-regional, where the parties concerned in job-placing and job-getting can get together without much travel, an element in its use is extra-regional.

The Chicago WPB staff deprecates stories of rivalry with any other regional plan. They say they stand ready to help manufacturers having required machines to get war contracts through any medium they desire in this or any other region.

Production Plus—Eight of ten victory workers at Ohio Crankshaft Company were jointly congratulated by Col. A. Robert Ginsburgh and William C. Dunn, company president. These employees received cash awards for production boosting suggestions in the firm's labor-management drive

A POUND OF REGULATION

WASHINGTON—Some 1,500 pages of regulations on procurement issued by the War Department have been cut to a single loose-leaf binder of 100 pages, weighing 1 lb. in comparison with the old volume weighing 18 lb. The revised regulations retain all essential information and fundamentals of procurement procedure on which the War Department's policy is based. The provisions of various Acts of Congress and Executive Orders have been correlated along with departmental instructions in this new volume. These regulations provide simple and practical interpretations of procedure for Army contracting officers and for contractors and speed the negotiation and award of contracts. They are being distributed to all contracting officers in the field.

Washington Appointments

Combined Production and Resources Board:
James S. Knowlson, deputy, American member; Sir Robert J. Sinclair, deputy, British member. Milton Katz and T. H. Brand, chief executive officers.

Office of Defense Transportation:
Warren W. Kelly, director of Section of Materials and Equipment.

Motor Transport Division: Frank M. Lanotte, manager, El Paso, Tex.; W. H. Thompson, manager, Fargo, N. D.; R. C. Coleman, manager, Kansas City, Mo.; V. J. Hons, manager, Omaha, Neb.; Donald T. Maentz, manager, Columbus, O.; W. R. Atkins, manager, New Orleans.

WPB, Division of Industry Operations:
Alexander Macdonald, deputy regional director, Los Angeles.

C. S. Reynolds, presiding officer, Tire Industry Technical Committee.

Dr. A. N. Holcombe, chairman, Appeals Board of Iron and Steel Branch, recalled to Washington from New York City.

Henry P. Nelson, chairman, Committee in Bureau of Priorities for administration of PRP.

WPB, Bureau of Industrial Conservation:
Arthur M. Houser, consultant, Simplification Branch.

WPB, Division of Materials:
E. H. Bucy, head, Protective Coatings Section, Chemicals Branch.

WPB, Procurement Policy Division:
Albert Weigand Luhrs, chief, Container Coordinating Section.

Office of Price Administration:
Robert R. R. Brooks, director, Labor Office.

NAMES in the NEWS

E. F. Johnson has been made vice president and group executive in charge of the recently organized Eastern Aircraft Div. of General Motors Corp. and of the corporation's six divisions in Dayton, Ohio. Organized to produce planes the Eastern Aircraft Div., with headquarters at Linden, N. J., is composed of five plants in New York, New Jersey and Maryland, most of which were formerly automobile assembly plants. Mr. Johnson has served with government war production agencies in Washington during the last two years.

Joseph A. Elwood has joined the George Gorton Machine Co. of Racine, Wis., as works manager. He is widely known in the machine tool industry and was one of the founders of the Racine Chapter of the American Society of Tool Engineers. Until recently Mr. Elwood has been factory manager of the Hydraulic Div. of Sundstrand Machine Tool Co.

F. W. McIntyre, vice president and general manager of Reed-Prentice Corp., Worcester, Mass., has returned to duties after spending fifteen months with the Tools Section of the War Production Board at Washington.

Harry L. Wise has become president and general manager of Hydraulic Machinery, Inc., of Detroit. He has been associated with the Ex-Cell-O Corp., Frederick Colman & Sons, Snyder Tool & Engineering Co., and for the last seven years has been sales engineer with Vickers, Inc.

H. E. Robinson has been appointed manager of the Strip-Sheet Sales Dept. of Jones & Laughlin Steel Corp., Pittsburgh. He was formerly vice president in charge of sales of the Otis Steel Co. of Cleveland, now the Jones & Laughlin Otis Works.

Eastern Aircraft Head *Gorton Works Manager* *Returns From WPB Job*

E. F. JOHNSON

J. A. ELWOOD

F. W. McINTYRE

H. L. Bills, director of industrial relations of Acme Steel Co., has been elected vice president of the Industrial Relations Association of Chicago.

J. M. Gilfillan, who has been works manager of the Locke Insulator Corp., Baltimore, for the past two years, has been named vice president in charge of manufacturing.

H. Ward Zimmer has been appointed general manager of operations of the Receiving Tube Div. of Hygrade Sylvania Corp. which includes three plants in Pennsylvania and one in New England. R. M. Wise has been named general manager of operations, Special and Large Tube Div. and will be responsible for radio tube research and production development.

James M. Hoghland has been made sales engineer in the Pacific Coast area for American Screw Co. of Providence, R. I. For the present he will be located in Hollywood.

General Manager

H. L. WISE

Manages Sheet Sales

H. E. ROBINSON

R. Nevin Watt has been appointed general sales manager of the Baldwin Locomotive Works, Philadelphia, and will have general supervision of sales of the Locomotive and Ordnance Div. and Standard Steel Works Div.

T. N. Bristow has become district manager of Cutler-Hammer, Inc., at Seattle, Wash. This office is now known as the District Sales Office. At the Philadelphia District Office R. Keeler has been added to the sales staff, in Cincinnati J. E. McSorley has joined the staff, and J. A. Darnell has been added to the New York District Office.

Robert H. Pyle has been appointed district representative for McKenna Metals Co. in southern Indiana with headquarters at 3801 College Ave., Indianapolis.

David Logan has been made district sales representative of American Foundry Equipment Co. with offices at 242 Broad St. Apartments, Newark, N. J. At Philadelphia Frank W. Pedrotty has been made district sales representative with headquarters at 911 Wynnewood Road.

S. H. Mortensen has become chief electrical engineer of the Allis-Chalmers Mfg. Co. plants at West Allis, Cincinnati, Boston and Pittsburgh.

J. A. Comstock of Pratt & Whitney Aircraft Div. of United Aircraft Corp. has assumed responsibility for all material control functions and will have charge of the Physical and Chemical Laboratories. A. W. F. Green continues as materials engineer and will devote his time to engineering phases of material and process activities.

Seward A. Covert has been appointed assistant to the president of Ohio Crankshaft Co., Cleveland, in charge of public relations and industrial publicity.

Elected President and Vice President of Elwell-Parker

S. K. TOWSON

Allied News Photo

W. A. MEDDICK

S. K. Towson has been appointed president and general manager of the Elwell-Parker Electric Co., Cleveland. Other officers recently announced are W. A. Meddick, vice president, and C. B. Cook, director in charge of export and government sales and general sales promotion.

Robinson D. Bullard, reclamation engineer for the Bullard Co., Bridgeport, Conn., has been appointed technical consultant to the Industrial Salvage Section of the Bureau of Industrial Conservation of WPB and will assist in the preparation of a definitive book on industrial reclamation.

John Hulst, vice president of United States Steel Corp., has retired after completion of more than 40 years of association with the corporation and its subsidiary companies.

R. A. Becker has been appointed manager of the Baltimore branch of Gar Wood Industries, Inc.

C. Granniss Bonner has been elected treasurer of Pomona Pump Co. of Pomona, Calif.

Frank J. Hill, who has been sales manager for many years of Greene, Tweed & Co., New York City, has been elected vice president.

Ralph P. Bell, director general of the Aircraft Production Branch, Department of Munitions and Supply, Ottawa, has been given the additional position of aircraft controller, Wartime Industries Control Board.

Evans Ward, president of Russell, Burdsall & Ward Bolt and Nut Co., has been named chairman of the Bolt and Nut Div. of the War Production Fund to Conserve Manpower, recently divided by industries under the National Safety Council.

BUSINESS ITEMS

Blanchard Machine Co., Cambridge, Mass., has designated as its representative in the Syracuse, N. Y., territory the C. H. Briggs Machine Tool Co. The area covered includes central New York State and some counties in northeastern Pennsylvania. The western New York portion, in the Buffalo and Rochester territory, will be represented by the George Keller Machinery Co. of Buffalo.

Colonial Broach Co. of Detroit will shortly occupy a new plant in that city which will greatly increase its broach manufacturing capacity. An expansion of the company's No. 2 plant in the same locality, completed about a year ago, is also planned.

Reynolds Machinery Co. has recently opened an office at Columbus, Ohio, to cover the section immediately surrounding that city. W. V. Terry has been placed in charge of the office.

Plomb Tool Co. of Los Angeles has organized facilities of 27 different companies into a subcontracting system for volume tool production under the name of Plomb Tools Contracting Co., a subsidiary of the parent company. Victor Kingman has been named president of the new company.

SKF Industries, Inc., has begun work on a new plant, the main building of which will be of one-story construction, with several other smaller structures.

Oilgear Co., Milwaukee, will build a new factory and office building at the cost of about $328,000.

H. M. Harper Co. has moved its New York City office to the Dodge Bldg., 45 W. Broadway. Earle A. Channer, many years in the sales department at the main office, is manager.

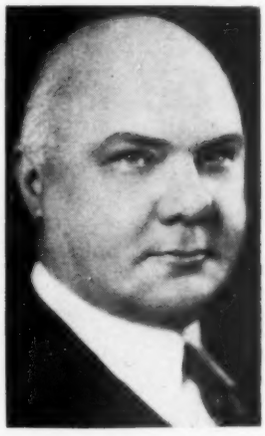
OBITUARIES

William F. Clark, 57, superintendent for 30 years of the Aluminum Specialty Co., Manitowoc, Wis., died recently.

Philip D. Block, 71, chairman of the executive committee of the Inland Steel Co., and formerly president of the company for 22 years, passed away in Chicago. He had been a principal factor in the organization of the company in 1893 and devoted an untiring effort in building up its resources.

Hugh Aikman, secretary and publicity manager of J. H. Williams & Co., Buffalo, died at his home in that city recently. Mr. Aikman was connected with the company for the past fifty years, and was elected secretary in 1920.

Robert F. Runge, 56, vice president of SKF Industries, Inc., died in Philadelphia after a prolonged illness. His entire business career was spent with SKF and Hess-Bright, its predecessor. Mr. Runge was a member of the American Society of Mechanical Engineers and the Society of Automotive Engineers for many years.



R. F. RUNGE

MEETINGS

National Safety Council. Annual meeting. Stevens Hotel, Chicago, Ill., Oct. 5-9.

National Metal Congress and Exposition. War Production Edition. Cleveland Public Auditorium. Oct. 12-16.

American Welding Society. Annual meeting. Hotel Cleveland, Cleveland, Ohio. Oct. 12-16.

American Society of Tool Engineers. Semi-annual meeting. Kimball Hotel, Springfield, Mass. Oct. 16-17.

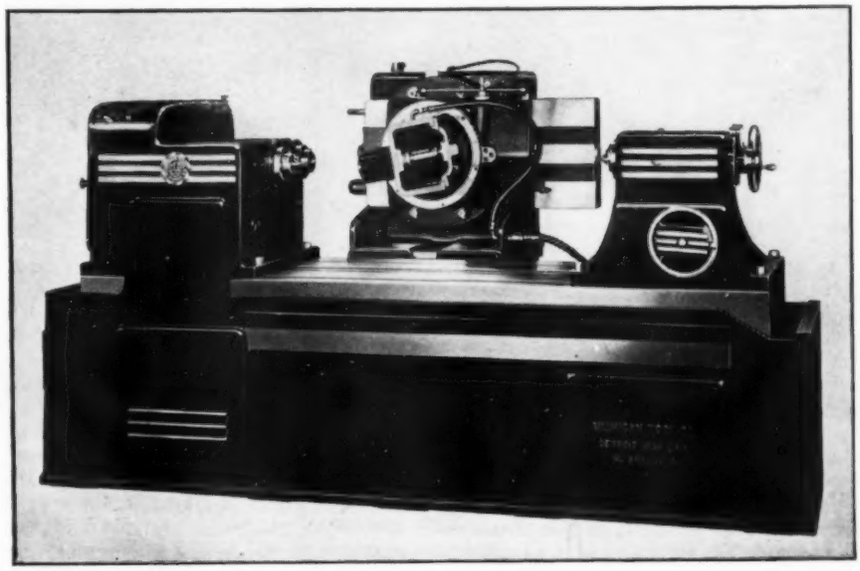
Wire Association. Annual meeting. Detroit-Leland Hotel, Detroit, Mich. Oct. 19-23.

National Electrical Manufacturers Assn. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. Oct. 26-30.

SHOP EQUIPMENT NEWS

Three Methods for Finishing Gears in Michigan Tool Heavy-Duty Gear Shaver

A rotary gear shaver, designated as the 865-36A, which utilizes the crossed-axis principle of gear finishing and capable of handling gears up to 36 in. in diameter has been announced by Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich. Three methods of finishing gears are available in this machine. In the first method, particularly suited to finishing of wide face gears, the cutter in addition to having an infeed toward the gear is also reciprocated parallel to the axis of the gear. This is accomplished by placing the slide which carries the cutter head in a horizontal position. The amount of infeed per stroke, length of stroke, number of oscillations after reaching center distance are all separately controllable, controls being electrical. Gears up to 20 in. face width can be finished at any point within 48 in. from the headstock when they are mounted on shafts which are up to 72 in. in length between centers.



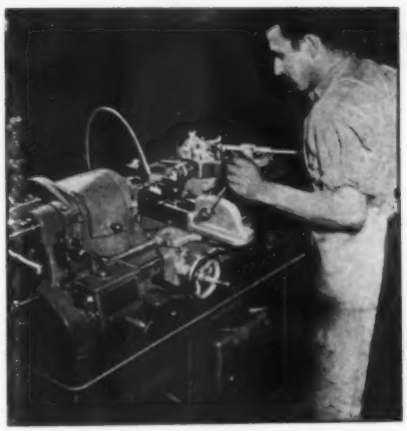
In the second method which is used for quick finishing of gears having narrower face width than the cutter, the slide is set vertically, the cutter however being in the same relationship to the gear as in the first method. Infeed is not used in the second method but the cutter head is located in such a manner that the axis of the cutter and axis of the gear, when viewed vertically, are at proper center distance from each other for correct depth of cut.

The third method represents a combination of the first and second methods. The cutter slide is again vertical, but infeed is used, the cutter head reciprocating vertically instead of horizontally as in the first method, the gear being finished by a number of vertical passes instead of one as in the second method. Any amount of infeed may be used. The cycle is automatically terminated in the first or third methods by means of a limit switch. Various colored lights are used to indicate to the operator the various circuit conditions existing during operation. If d.c. current is to be used a floor mounted panel is supplied, while for a.c. the control panel is mounted in the base of the machine. The power required is 5 hp. at 1,200 r.p.m.

South Bend Bench Turret Lathe Adapted for Second Operations

For rapid production to close tolerances on chucking operations or bar work the South Bend Lathe Works, South Bend, Ind., has available a bench model turret lathe. This machine has a 10 in. swing over the bed and saddle wings, 1⅜ in. hole through the headstock spindle and 1 in. collet capacity. It is well adapted to second operation work.

The handlever operated bed turret

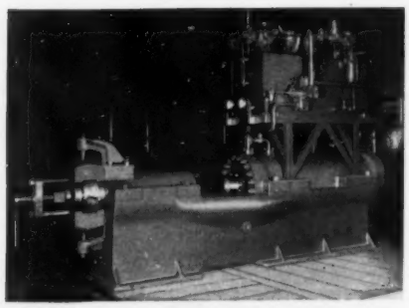


indexes automatically and has an adjustable stop for each of the six turret faces. The lathe is equipped with both a compound rest cross-slide and handlever cross-slide which are interchangeable. The latter is furnished with front and rear tool blocks which provide three tool positions. A quick change gear box supplies 48 longitudinal power feeds for the universal carriage, the same quantity power crossfeeds for the compound rest cross-slide and 48 thread cutting feeds, 4 to 224 per inch. The underneath motor drive and back gears deliver twelve spindle speeds from 97 to 700 r.p.m.

High Production Capacities From Beatty Hydraulic Extruding Press

An improved Model No. 100 hydraulic extruding press with high production capacities has been announced by Beatty Machine & Mfg. Co., Hammond, Ind. It is a self-contained unit with a rigid one-piece frame that eliminates the need for tie rods. Cylinders are mounted horizontally to provide easy access to the loading chamber. The duplex pumping unit provides for rapid movement of the plunger on advance and return stroke, a variable speed control feeds material at the rate required for various sizes of electrodes.

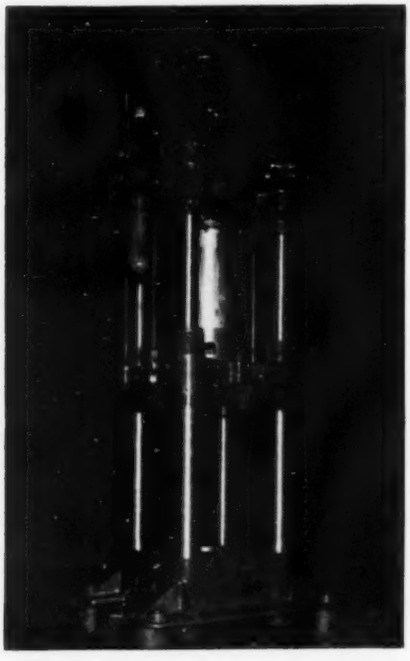
The press is actuated by a double acting hydraulic cylinder which eliminates outside pull back cylinders and the consequent waste of floor space. The hydraulic pumping equipment, including pumps, relief and control valves, oil reservoir and pressure gage are mounted directly above the main cylinder out of reach of possible damage from floor conveyances. The material cylinders on the extruding press are 50 in. long, but the machine is also arranged for 72-in. material cylinder. This length provides space for three



16-in. slugs. The rapid return and advance to the material decreases the loading time to a minimum. The press is designed to give a working pressure of 10,000 lb. per sq.in. on the coating material in the material chamber. A manual adjustment within easy reach of the operator gives pressure and velocity changes as required.

Baldwin 500-Ton Piercing Press Built for Shell Work

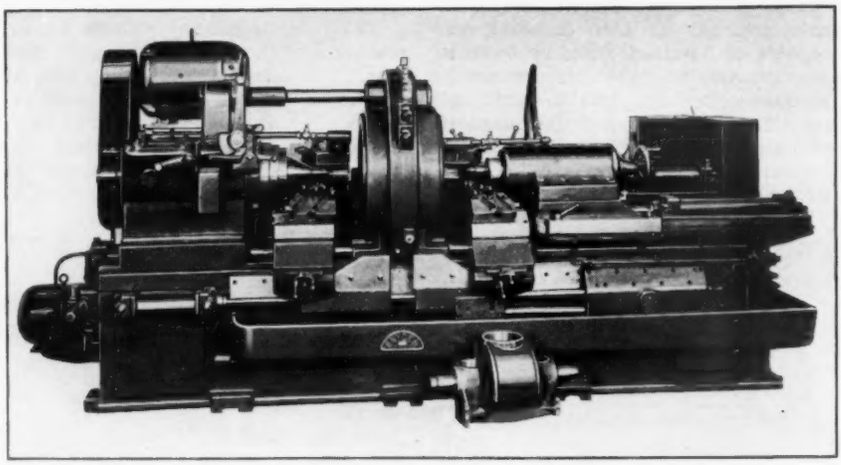
For operation in shell forging work the Baldwin Southwark Div. of Baldwin Locomotive Works, Philadelphia, Pa., has announced a 500-ton piercing press. The main ram of the press has a diameter of 32 in., a stroke of 42 in. The working pressure of the machine is 1,500 lb. The distance between platens is 99 in. and the stripper cylinder in the bottom platen has a diameter of 12 in. It is complete with



operating valves and piping and is of all cast steel construction. Press columns are especially sturdy to withstand the heavy service of 240 strokes per hr. on a 24-hr. operation. All rams are of hard cast iron while all cylinder guides and column guides have bronze bushings. The press requires a floor space of 7 ft., 2 in. by 6 ft., with overall height of 25 ft. 3¼ in.

Snyder Heavy-Duty Turning Machine Features Hydraulic Feed Operation

A heavy-duty, double-end hydraulic turning machine has been announced by Snyder Tool & Engineering Co., 3400 E. Lafayette St., Detroit, Mich. A feature of the machine is the hydraulic feed operated from a single hydraulic power unit in the rear of the machine. The unit furnishes power to both front and rear tool slides as well as to the tailstock. The movement of the tailstock is controlled by a hand operated



valve and facilitates loading and unloading of the piece by pushing it forward into the center drive fixture. After this operation has been performed the part is clamped manually and the tailstock locked in place ready for the first of the two turning operations.

The right hand tool bracket, when swung into clearance position, provides a loading platform in line with the locating surface in the center drive.

A further function of the hydraulic system is the actuating of the front and rear tool slides. A single cylinder is used to cam the two front slides into position, at which point the cams stop moving and the tool slides are traveled through their work cycle. Each front tool slide has its own hydraulic cylinder, and the slides are racked together to permit a single hydraulic and electrical control. Likewise, the rear tool slides are kept synchronized by a pair of hydraulically actuated cam plates which move the slides through a rapid advance and feed cycle.

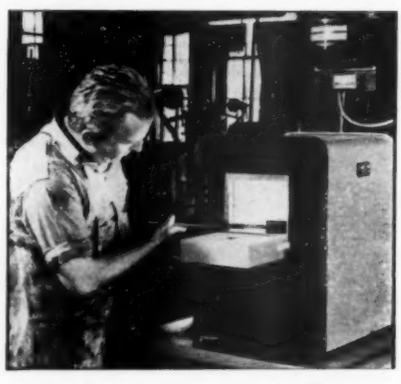
The base of the machine is welded steel construction, well ribbed for rigidity, and the machine itself is constructed with very heavy cross sections in all vital parts. The base functions as a large chip trough and coolant container, the chips being removed from the rear of the machine. The coolant is circulated to the cutting tools by a motorized pump at the rear of the machine.

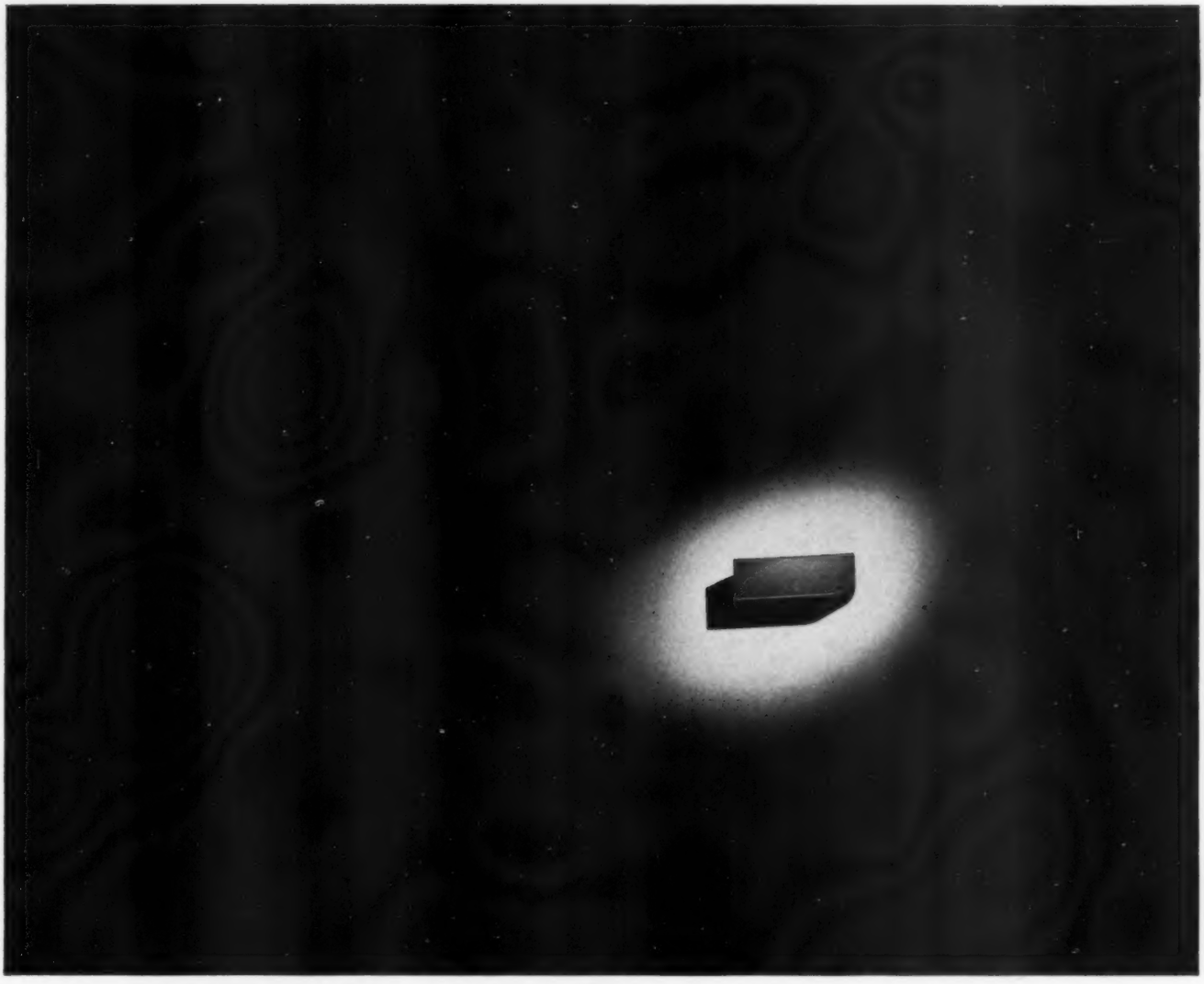
Cooley Muffle Furnace Speeds Heat-Treating of Small Parts

A small electric muffle furnace for economical and fast heat-treating of small parts developed by Cooley Electric Mfg. Corp., 215 S. Senate Ave., Indianapolis, Ind. is available in two sizes. Other uses include drawing or tempering, normalizing or annealing, preheating for subsequent high-speed hardening and emergency repairs of small parts. The furnace can also be used as auxiliary equipment to larger furnaces.

The outer shell is made of heavy gage sheet steel interposed between cast iron end frames secured by through rods. Four interlocking rectangular elements form the interior of the chamber and replacement can be made without difficulty. The elements are of the embedded type which afford protection to the wire from atmospheric attack. The furnaces are supplied with either automatic or hand control, but use of the former affords more protection.

Type MH-3 has a chamber capacity 8 × 6 × 14 in. Maximum power con-





"METALLIC VITAMINS" FOR INDUSTRY

So effective are relatively minute quantities of cemented carbides in stepping up—pepping up—production that they are often called the "metallic vitamins" of industry.

Because only small quantities are required per tool, Carboloy cemented carbides are measured in grams. A gram is 1/453rd part of a pound. A Carboloy tool tip weighing only 25 grams or slightly less than one *ounce* is a good size tip—enough to last for days, weeks—often months of cutting at speeds often higher than 4 to 5 times that possible with ordinary steel tools.

In terms of production, an ounce of cemented carbide can turn the turrets of dozens of tanks, or drill hundreds of guns, or turn as many as several hundred shell, or bore the cylinders of hundreds of "Jeep" cars. One ounce of Carboloy can do these and countless other crucial machining jobs faster and better than any other tool material.

These "metallic vitamins" also serve the cause of victory in many other ways. On masonry drills, they drill holes 75% faster for installing war production machinery. . . . In dies they speed up production of wire, cartridge cases, bullets, etc. . . . As wear-resistant inserts on vital machine parts, they keep machines running. As a matrix material, they conserve diamonds, shorten operating time on mine drilling, dressing of grinding wheels, etc.

The myriad of present uses for Carboloy—the "metallic vitamin" of industry—now helping to speed the day of victory, forecast the steadily increasing diversity of benefits for the years of peace to come. ★★ Carboloy Company, Inc., Detroit, Mich., Chicago, Cleveland, Los Angeles, Newark, Philadelphia, Pittsburgh, Seattle.

CARBOLOY

TOOLS • DIES • GRINDING WHEEL DRESSERS
CORE BITS • MASONRY DRILLS • WEAR PARTS

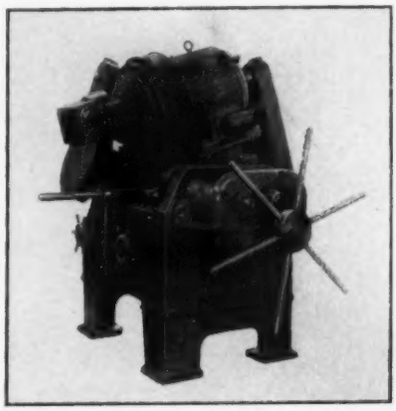
MANUFACTURERS OF TOOLS, GAUGES, ETC., SUPPLYING PRODUCTS TIPPED WITH CARBOLOY CEMENTED CARBIDES

B. C. Ames ... Waltham, Mass.
Apex Tool & Cutter, Shelton, Conn.
Barber-Colman ... Rockford, Ill.
Bokum Tool ... Detroit
Carbide Tool ... Chicago
Cleveland Cutter & Reamer ... Cleveland
Cleveland Twist Drill ... Cleveland
Cogsdill Twist Drill ... Detroit
Cole Carbide ... Royal Oak, Mich.
A. A. Crafts ... Boston
Criterion Machine Wks. ... Beverly Hills, Calif.
Davis Boring Tool ... St. Louis
Detroit Boring Bar ... Detroit
Henry Disston & Sons ... Philadelphia
Eclipse Counterbore ... Detroit
Ex-Cell-O Corp. ... Detroit
C. J. Farthman ... Cincinnati
Gairing Tool ... Detroit
Gen. Eng. & Model Wks. Pittsburgh
Genesee Tool ... Fenton, Mich.
Gern & Anholt Tool ... Detroit
Goddard & Goddard ... Detroit
Gorham Tool ... Detroit
Hartley Wire Die ... Thomaston, Conn.
Kelly Reamer ... Cleveland
Kiffer Tool & Die ... Cleveland
Lincoln Park Tool & Gage ... Lincoln Park, Mich.
Lovejoy Tool, Springfield, Vermont
Madison Mfg. ... Muskegon, Mich.
McCrosky Tool ... Meadville, Pa.
Midwest Tool & Mfg. ... Detroit
Metro Tool & Gage ... Chicago
Morse Tool ... Detroit
Morse Twist Drill & Machine ... New Bedford, Mass.
Motor Tool Mfg. ... Detroit
National Tool ... Cleveland
C. K. Tool ... Shelton, Conn.
J. S. Pepper, Inc., Union City, N.J.
Production Tool Co. of America ... Detroit
Reeder Carbide Tool ... Detroit
R. & M. Mfg. ... Detroit
Scully Jones ... Chicago
Sheffield Corp. ... Dayton, Ohio
Ralph Shipman ... Sunbury, Pa.
Simonds Saw & Steel ... Fitchburg, Mass.
Landon P. Smith, Irvington, N. J.
Sommer & Maca Glass Machinery ... Chicago
Sprague & Henwood, Scranton, Pa.
Standard Gage, Poughkeepsie, N.Y.
Standard Tool ... Cleveland
Staples Tool & Engineering ... Cincinnati
L. S. Starrett ... Athol, Mass.
Strauss Co. ... Pittsburgh
Super Tool ... Detroit
Truber Tool ... Yonkers, N. Y.
Tungsten Carbide Tool ... Detroit
United Twist Drill & Tool, Chicago
Van Keuren Co. ... Boston
Harry W. Wagner ... New York
Walker Tool ... Cleveland
Wendt-Sonis Drill Wks. ... Hannibal, Mo.
Wesson Co. ... Detroit
Weimore Reamer ... Milwaukee

sumption is 3400 watts. Type MH-4 furnace has a chamber capacity of 10 × 6 × 18 in. Maximum power consumption is 3400 watts.

Medart Bar and Tube Machine Straightens, Sizes and Polishes

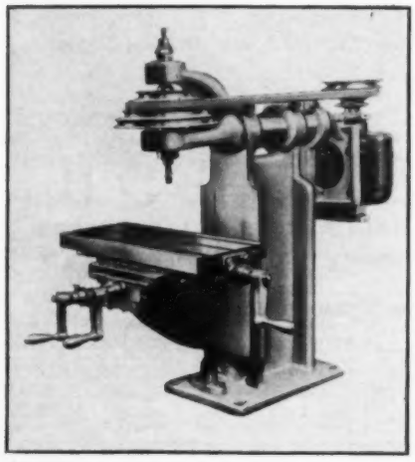
Lower cost, faster production and greatly increased range of size and conditioning applications feature the 2 & 2 universal bar and tube straightening, sizing and polishing machine announced by the Medart Co., St. Louis, Mo. Output speeds of 50 to 1,000 ft. per



min. can be obtained, depending upon the conditions involved and gear ratios specified for the four-speed, built-in shifts. An exceptional range of conditioning applications is achieved through the flexible adjustments which have been included and by mounting each motor upon the same adjustable member which supports its driven roll. This machine is made in four sizes to accommodate bars and tubes from 1/16 to 6 in. in diameter.

Duro Bench Miller Adaptable to Tool Room and Production Lines

Equally adaptable to the tool room and high speed production lines the Duro Manufacturing Co., 800 E. 61st St., Los Angeles, Calif., has introduced a precision vertical bench milling ma-



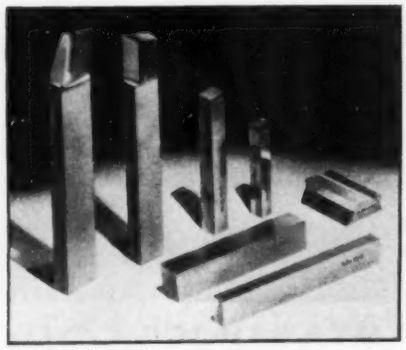
chine. This equipment has precision taper roller bearings in the spindle. Splined disengageable handles operate micrometer adjustments for each direction of the table movement. The vertical travel of the table is 7 in., longitudinal travel 8 in. and transverse travel 5 in.

The one-piece solid spindle support arm is equipped with an adjustable graduated dial and index pin. Adjustments can be made to 60 deg. each side of center. Operation is accurate to one-thousandth of an inch.

A "floating" motor mount maintains proper tension of the V-belt at all times and permits instant manual change through the four spindle speeds of 450. 850. 1400 and 2100 r.p.m.

Stellite 98M2 Tools of New Alloy Speed Up Machining

Stellite 98M2 tools made of a new cobalt-chromium-tungsten alloy and designed to increase speed of machining steel have been introduced by Haynes Stellite Co., Kokomo, Ind. This alloy

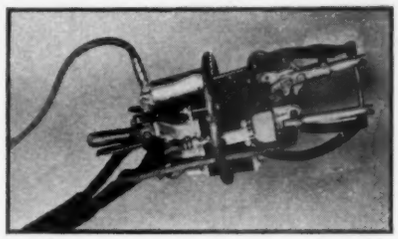


is well balanced in red hardness, edge strength and toughness. The tools are available in standard square and rectangular solid bits and in 20 standard styles of welded-tip tools of various sizes for turning, facing and boring.

Progressive Welder Develops Flexible Spot Welding Unit

A standardized flexible installation for production spot welding in assembly of light-gage aircraft steels, including stainless steel types, has been developed by Progressive Welder Co., 3001 E. Outer Drive, Detroit, Mich. Refrigerated electrodes, variable throat-depth and welding transformer built into a light weight welding gun are among the features incorporated in the installation, which includes a jib crane with 6-ft. trolley-type arm. The gun hanger is so designed that the gun may be swiveled 360 deg. in any plane.

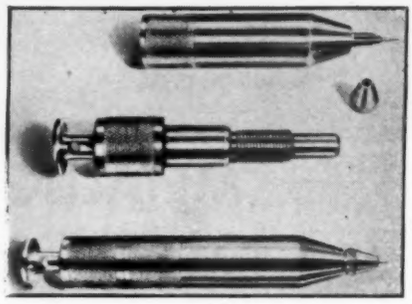
The gun is of the air-operated type and normally carries relatively small diameter electrodes which permit obtaining the needed welding pressure per sq.in. through a simple air cylinder mounted on the gun. A "Frostrode"



refrigerating unit mounted on top of the jib crane circulates brine through the electrodes, maintaining them at below freezing temperatures. While the gun design is standardized as to subassemblies, the latter may be assembled in a number of different ways in order to meet individual or specialized welding requirements.

Aero Tool Precision Plumb Bob Features Phonograph Needle

A precision plumb bob, adaptable to jig installations as well as other operations where precision aligning is necessary, has been announced by Aero Tool Co., 231 West Olive Ave., Burbank, Calif. A special feature is the use of a phonograph needle, assuring a true and constantly sharp point, which is held by a watchmaker's pin chuck at the indicating end. The hole for the suspension wire is held to exact size



and is absolutely centered with the indicating point. Three bearing surfaces between the upper and lower parts hold them concentric. Thus by simply rotating one part upon the other it is possible to raise or lower the indicating point over ½ in. without losing concentricity.

Stewart-Warner Portable Stations Provide Instant Lubrication

Three portable model Alemite service stations for industrial lubrication have been introduced by Stewart-Warner Corp., Alemite Div., 1800 Diversey Parkway, Chicago, Ill. Each unit is designed for mounting on hand or electric trucks for instant operation in all parts of a plant. They can be handled by one man or several operators can work from the same unit simultaneously. Convenient hose lengths facilitate the servicing of hard-to-reach bearings and housings; combination control valve and meter for registering amount of

WAR PRODUCTION- 33½ HOURS PER DAY!

SUNOCO EMULSIFYING CUTTING OIL

increased output 40%...stepped up tool life...improved finish

It takes bullets to win battles, and American ingenuity is finding ways to set amazing records in the race for arms production.

For example, in a plant turning out bullet-assembling machines, excess heat on tools and work, poor finish, and operators' skin complaints were restricting production. A Sun Oil Engineer — one of those capable Doctors of Industry — was called in to improve conditions. He recommended a change in cutting fluid . . . to Sunoco Emulsifying Cutting Oil. Now they're using Sunoco . . . and rate of production has increased 40% — equivalent to an extra 9½ hour shift every day! Finish has also improved, and skin trouble vanished.

Sun Doctors of Industry and Sunoco Emulsifying Cutting Oil stand ready . . . willing . . . and able to help you step up production in your shop. For helpful case histories of what they have accomplished for other leaders in the metal working industry, write for your free copy of "Helping Industry Help America."

SUN OIL COMPANY • Philadelphia

Sun Oil Company, Ltd., Toronto

LET'S GO! U.S.A. KEEP 'EM FLYING!

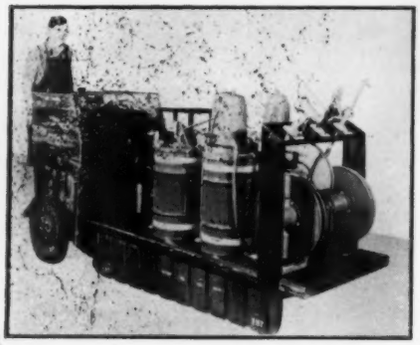
SUNOCO

SUN PETROLEUM PRODUCTS HELPING INDUSTRY HELP AMERICA

lubricants used; outlets for both high pressure and volume lubrication and facilities for handling all grades of grease, oils and slushing compounds.

The standard models of these power driven lubricators, which are of four and six unit capacity, include a high pressure pump with 20 ft. of hose on reel for power lubrication of pressure gun fittings, also low pressure power pumps with 15 ft. hose on reel for dispensing gear lubricants and machine oils. Part of the Standard model equipment includes two or more hand operated low pressure pumps, depending on model size, for dispensing oil and lubricants.

Air compressor or air hose mounted on reel for quick connection to plant

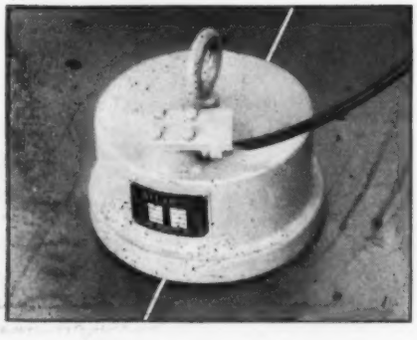


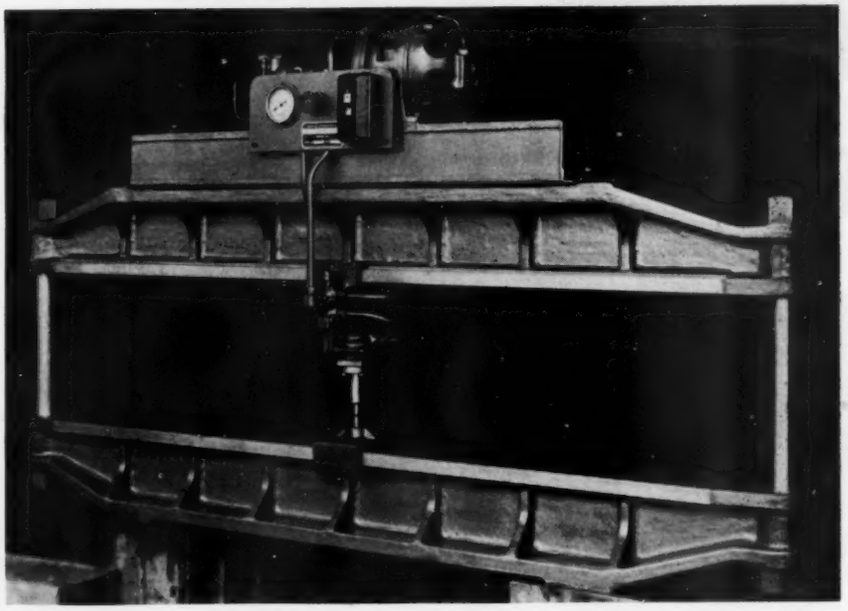
air lines are supplied on all models. Units are equipped with shelves, racks and drawers for tools, waste, etc. Complete Alemite service stations mounted on a base measure 3×7 ft. and 3×8 ft., depending on model and capacity.

Stearns Holding Magnet Saves Time and Labor on Welding Jobs

A magnetic welding clamp has been announced by Stearns Magnetic Mfg. Co., Milwaukee, Wis. It is designed in various sizes, the one shown being 10 in. in diameter and weighing approximately 70 lb. with a pull of 2,000 lb. on ¾ in. and 1 in. steel plates, and operates from 40 or 60 volts d.c.

By the use of this holding magnet the plates are drawn to a level alignment with the edges brought flush against the perfect surface of the magnet. By tacking welds to the plates on either side of the magnet the welder is able to maintain alignment and save time and labor.





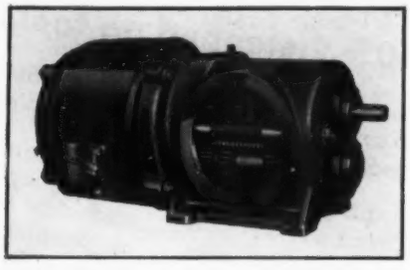
Lake Erie 10-Ton Hydraulic Riveter Handles Large Work

A 10-ton hydraulic riveting machine has been announced by the Lake Erie Engineering Corp., Buffalo, N. Y. It has 9 ft. 10 in. clearance between tie rods for handling large work. The entire machine is self-contained with pumping unit including surge tank mounted on top.

The upper and lower cross members are of webbed I-beam construction to assure rigidity at all points laterally. The riveter is mounted on the upper cross member and the anvil on the lower member. A manually operated valve controls the pressure of the riveting downward and return strokes. The machine has a 3 in. stroke and 5-in. diameter ram. The over-all length is 10 ft. 6 in.

R & M Machine Drive Increases Efficiency and Flexibility

A machine drive which increases efficiency of both old and new machines is announced by Robbins & Myers, Inc.,



Springfield, Ohio. Greater flexibility and efficiency of both machine and operator are made possible by individual control. Complex line and shafting are eliminated. The drive is extremely simple to install. It is mounted by drilling only four holes and inserting four cap screws.

Powered by either a single or two-speed Robbins & Myers induction motor ranging from 1 to 7½ hp., the drive's speed reduction is accomplished by a gear case designed as an integral part of the motor head. A gear shift with finger-tip control is within easy reach of the operator, and provides three speeds and six speeds with single and two-speed motors respectively. All gears operate in a continuous bath of oil, which is easily checked by a conveniently-located bayonet-plug type oil lever indicator. The motor itself is provided with air vents for cooling, and will stand reversal without excessive heating by plugging at light loads for short periods.

'Alfcospray' Water Nozzle Permits Immediate Cone Spray

A variable, all-spray nozzle for water, without a straight stream, called the "Alfcospray" has been introduced by American - LaFrance - Foamite Corp., Elmira, N. Y. A slight turn of the tip gives a cone spray of 40 deg. Further slight rotation produces increasing

Pipe Bending Presses

for America's Shipyards

MOST BENDS can be made cold on this powerful 200-ton Southwark hydraulic pipe bending press. Time required for heating the pipe is saved and distortion of bend due to cooling shrinkage is eliminated.

Self-contained, this oil operated Southwark hydraulic press is under perfect control of the operator at all times — a feature particularly valuable during difficult bends. Southwark pipe bending presses are time and money savers.

Southwark builds a complete line of shipbuilding machinery including bending rolls, plate planers, keel benders, sectional flanging presses and joggling presses. New designs in these hydraulic presses and power tools are helping shipbuilders do a better job faster. Write for Bulletin K-160 which illustrates many of these products.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco, California.

BALDWIN

Southwark

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DIVISION OF THE BALDWIN LOCOMOTIVE WORKS • PHILADELPHIA

cones up to full curtain of 150 deg. with reversal back to shut-off without any intervening straight stream. This model is suitable for extinguishing oil fires and for general cooling purposes. The nozzle in the full curtain position provides an effective water screen to protect men and property behind it.

This Model 10F nozzle is furnished for any 2½ in., 2 in. or 1½ in. hose thread and for Underwriters' tip thread. In the 40 deg. spray position, the capacity is about 95 g.p.m. and 135 g.p.m. at 50 lb. and 100 lb. inlet water pressures respectively. The full curtain capacity at these pressures is approximately 170 g.p.m. and 215 g.p.m.

Industrial Gloves Grinder Guard Gives Free Finger Use

A long-wearing, sturdy, comfortable handguard for grinders has been introduced by Industrial Gloves Co., Danville, Ill. It is designated as guard No. 13914, and is made of tough chrome tanned cowhide reinforced on the back

with an extra patch of leather, steel reinforced. The guard is mitten type, open at the end to give free use of fingers in picking up parts or tools, and made to be worn over a regular glove or mitten. The seams are stitched with steel thread which makes the guard practically rip-proof. This guard may be secured as pairs, all rights, lefts or any combination required.

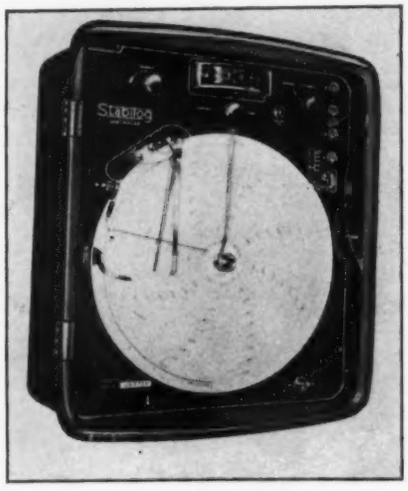
National Air-Operated Block Sander Eliminates Vibration

A small size block sander has been announced by National Air Sander, Inc., Rockford, Ill. The unit, named the "Mity-Midget", is hand size, 5½ in. long, 4¼ in. high, and weighs 3½ lb. It is air-operated.

Among the features of the sander is the elimination of vibration which precludes fatigue. It is particularly suitable for close fillet work and small surfaces as well as large areas, and can be used for metal, wood or composition surfaces. The trigger starter fits the palm of the hand, permitting positive hair-line control. Both wet and dry sanding are possible.

Foxboro Stabilog Controller Includes Hyper-Reset Control

A control function known as Hyper-Reset, available in the Model 30 Stabilog controller, has been introduced by the Foxboro Co., Foxboro, Mass. It is



intended for application where process lag is considerable. It reduces the effects of a process disturbance by making initial temporary additional corrections, which are proportional to the rates of change of the measured value caused by the disturbance. The normal reset follows, establishing stabilization. The several control functions carried out by Hyper-Reset are simultaneously and automatically adjusted, no tuning-in is necessary and no more than two process adjustments are required, proportional and Hyper-Reset.

Union Metal Skid Box Stores, Cools Hot Forgings

Development of an insulated skid box for storing and cooling hot forgings has been made by the Union Metal Mfg. Co., Canton, Ohio. The unit has a 7-gage skid, a 9-gage outer casing, and a 12-gage inner casing with a ¾ in. asbestos lining in between. The lid is also reinforced and insulated. The box can be picked up by a crane or lift truck and stored out of the way until the forgings have cooled thus providing an insurance against flaking and saving in time over the method of burying the forgings. The skid box is available in sizes to meet individual requirements.

Sav-Way Internal Grinder Offers Flexibility of Work

An internal precision grinder for grinding holes up to 9 in. deep and from ¼ to 18 in. in diameter, straight or tapered sides, has been introduced by Sav-Way Tool and Machining Co., 13842 Joseph Campau Ave., Detroit, Mich. It is claimed that this machine offers greater flexibility and will handle a wider range of work than was formerly possible on any one model.

The headstock is so constructed that by loosening of two nuts an adjustment can be made to a distance of 3½ in. at right angles to the wheel traverse. This permits grinding of angles not heretofore reached by rotation of headstock or traverse of the wheel.

The grinding wheel head may be adjusted to .0001. The diamond holder is of the swing type with micrometer adjustment, enabling the operator to set the diamond accurately for sizing holes.

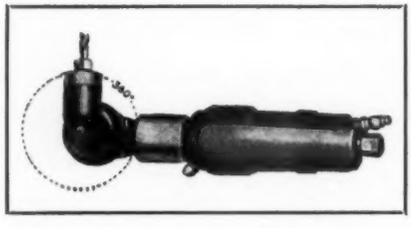
The grinder measures 40x22 in. at the base, and is suitable for both tool room and production grinding. It is equipped with automatic wheel guard, motors, bearings, coolant pump, electric controls and grinding spindle.

Oil-Rite Lubricator Has Only Three Simple Parts

To insure adequate lubrication at all times, prevent oil waste, and the deterioration or spoilage of material caused by oil throw the Oil Rite Corp., 3466 S. 13th St., Milwaukee, Wis., has introduced the Oil-Rite constant level lubricator. Among the purposes it serves are on electric motors, pillow blocks, pumps, air conditioning equipment, gear boxes and other machinery parts. The lubricator consists of only three simple parts. The base is cast with an integral open air vent which extends part way up into the oil reservoir. Over this vent an invented bucket is fitted loosely. The reservoir proper is a glass dome, sealed to a metal collar by plastic porcelain cement which is impervious to acids, oils, water and heat. Two spring clips lock the oil reservoir in position. Four standard sizes with capacities of 2, 4, 8 and 16 oz. are available.

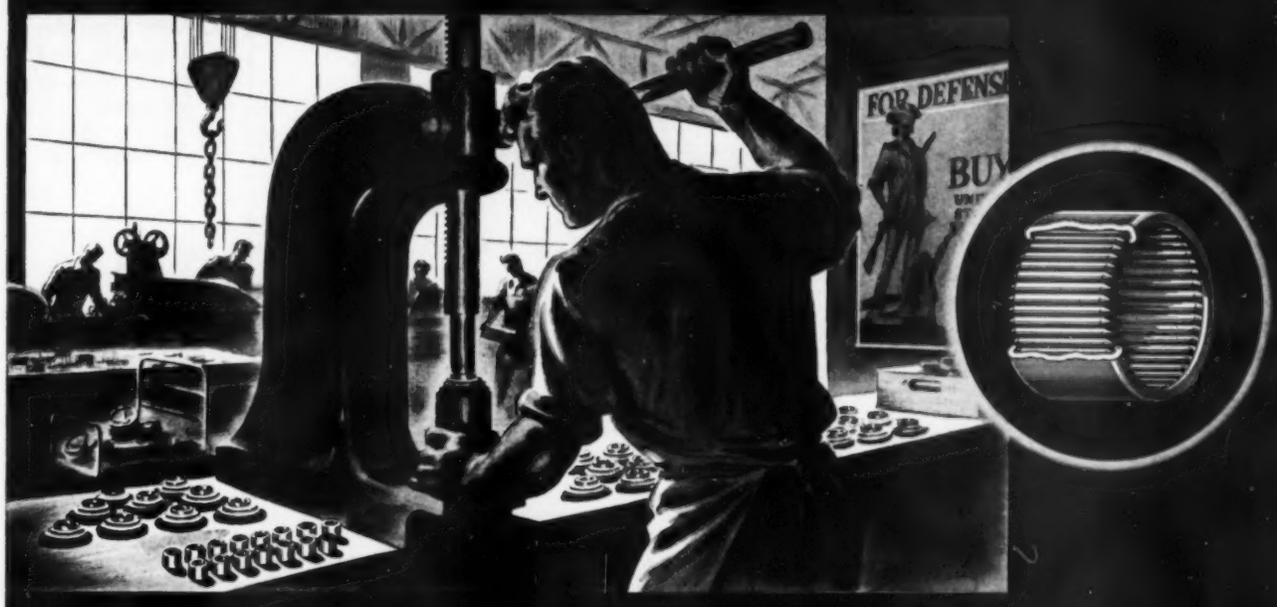
Cleveland Pneumatic Drills Will Operate at Any Angle

The Cleveland Pneumatic Tool Co., Cleveland, Ohio, has introduced Models 9D010 and 9D020 multiple angle drills, with speeds of 1,000 and 2,000 r.p.m. respectively. This rotary drill features



a drilling head which can be set at any angle through 360 deg., thus fulfilling the function of several angle drills. The head swivels in two planes. Besides the facility with which it can be set for drilling at any angle, it can also be turned to any position relative to the location of the throttle lever. The design permits the fingers of the

FAMILIAR NAME ON



NEW ASSEMBLY LINES

NOW it's aircraft engines where sedans "used to grow"... or plastics instead of critical metals... or welding replacing rivets. The man on the assembly line has *seen* the changes taking place—one after another.

One thing, though, hasn't changed—merely "changed over" to war production. In the Torrington Needle Bearing, veteran production men recognize an old familiar name. For this unique bearing is proving its adaptability anew, in applications where its advantages mean more today than ever.

Its ease of installation, for example, is cutting assembly time... enabling green hands to "catch on" more rapidly, experienced hands to work with the speed and efficiency war production schedules demand.

Every feature of the Needle Bearing, in fact, is filling some vital wartime need. Its small size is saving space and critical materials; its simplified design is eliminating extra parts and assembly steps; its low coefficient of friction, assuring smooth performance ... high capacity and efficient lubrication, reducing the need for replacement or maintenance attention.

And so it is easy to understand why the Torrington Needle Bearing is in service today on new assembly lines all over America—assembly lines geared to production-for-Victory.

***FOR INFORMATION** concerning capacities and sizes, send for Catalog No. 105. Or consult a Torrington engineer. He is an expert in adapting the Needle Bearing's unique advantages to specific problems.*

THE TORRINGTON COMPANY
TORRINGTON, CONN., U. S. A. • *Est. 1866*
Makers of Needle and Ball Bearings

New York · Boston · Philadelphia · Detroit
Cleveland · Seattle · Chicago · Los Angeles
San Francisco · Toronto · London, England

TORRINGTON NEEDLE BEARING

Every feature fills a wartime need

operator's hand to be brought close to the point of application, increasing accuracy of handling the drill and insuring greater speed in changing from one position to another. The drill weighs 2½ lb. and is about 8 in. long when set for drilling in direction parallel to the center line. The chuck is for ¼-in. drill.

Specialties Mfg. Introduces Barrel Trucks for Air Raids

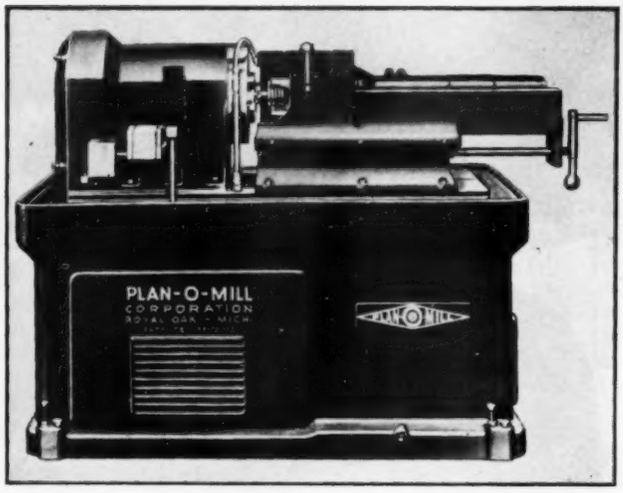
For air raid use the Specialties Manufacturing Co., Inc., 35 Farrand St., Bloomfield, N. J., has announced a stirrup pump barrel and a sand barrel truck. The barrel pump extinguisher consists of a twenty-gallon barrel, mounted on wooden wheels. Two handles are attached for carrying. A stirrup pump is fitted into the top of the barrel. An axe is attached to the side of the barrel. The entire unit is painted a bright yellow for visibility in the dark, and if desired can be furnished with luminous paint.

The sand barrel is equipped with an open top of approximately two and a half cu.ft. capacity, and is equipped with shovel and axe.

Krembs 'Fluxined-Spelter' Process Joins Tips to Tools

A process for joining cutting tips to tools called "Fluxined-Spelter" has been developed by Krembs & Co., 669 W. Ohio St., Chicago, Ill. This method of joining carbide and all other types of cutting tips and cutting blades to tool shanks is adapted to both small and large scale production and can be used with the furnace, spot welding or torch methods. The material is brushed onto the contacting surfaces of both the cutting tip and tool shank. The work is then assembled to form a tight fit and brazed, and when completed the braze looks like a gold-plated joint, leaving no waste of joining material.

Plan-O-Mill Improved With Thy-mo-trol Feed Control



The use of a General Electric Thy-mo-trol feed control on this improved Plan-O-Mill provides a complete and stepless range of feed control

Improvements in the Model 3 Plan-O-Mill planetary milling machine announced by the Plan-O-Mill Corp. (formerly Gordon-R Co.), Royal Oak, Mich., include the use of a General Electric Thy-mo-trol feed control which has been built into the machine. Converting alternating current into direct current, this feed control provides an infinite and stepless range of feed, both into and around the work, by regulating the flow of current to the feed motor. Changing gears and sheaves is unnecessary.

This development is designed to promote maximum production consistent with maximum cutter life. Parts too cumbersome or irregular in shape for the conventional machine can be milled speedily and accurately since all motion is in the milling head. The part does not move.

The Plan-O-Mill is suited to many types of form milling in addition to its use for internal and external, right or left hand, threading and form milling where rapid production, precision and high finish are required.

Hygrade Sylvania Makes 8-Watt Fluorescent Extension Light

A fluorescent extension cord light has been made by Hygrade Sylvania Corp., Lighting Div., Ipswich, Mass. The unit is light weight, compact and so cool that it may be clipped to the worker's belt or hooked into the coat lapel, leaving both hands free. The lamp may be replaced in a few seconds. The 8-watt light furnishes an adequate quantity of light of low surface brightness with no glare. This unit is suitable for work is confined areas and close inspection. Its over-all length is 9½ in., width 1 in. and height 1¾ in. The grille protecting the lamp is constructed of heavy gage steel.

Huge Stearns Magnetic Pulley Cooled With Special Air Vents

Stearns Magnetic Mfg. Co., Milwaukee, Wis. has developed a magnetic pulley 48 in. in diameter and 64 in. long, weighing approximately 20,000 lb. Steel cover bands of heavy proportions protect the coils and at the same time evenly distribute lines of magnetic force over the entire face of the pulley.

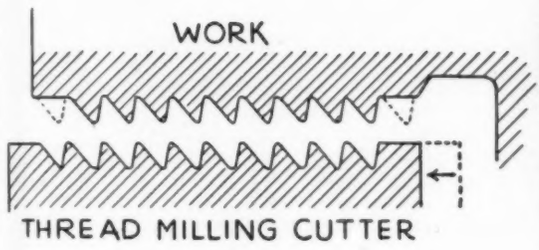
Specially designed air vents provide for cooling by permitting air currents to circulate around the coil pockets in addition to the air flowing freely through the open interior of the pulley. Added cooling is provided by the deep ribbed design of the coil castings.

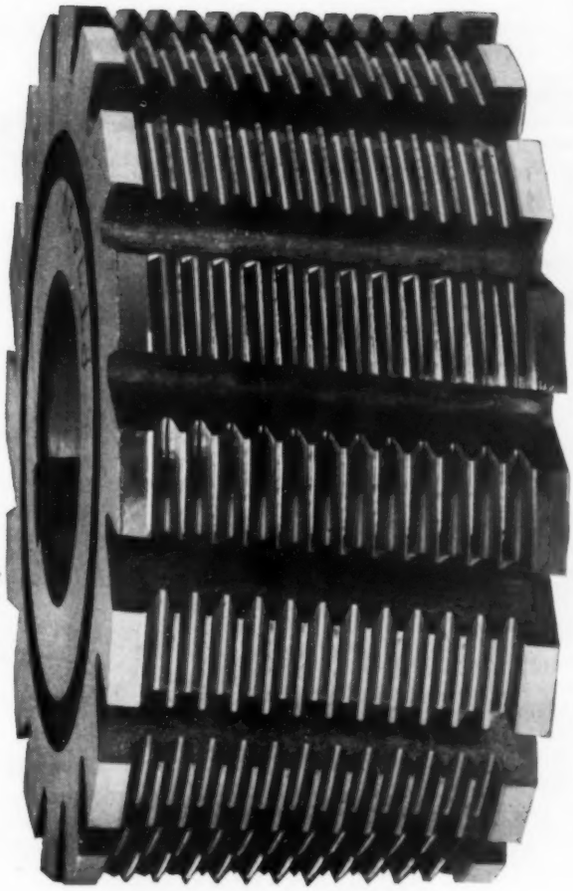
Richards-Wilcox Chain Type Conveyor Has Tubular Track

A chain-type conveyor system has been introduced by Richards-Wilcox Mfg. Co., Aurora, Ill., which consists of a steel tubular track in which is a continuous chain made up of a series of vertical and horizontal wheel units. The vertical wheels are connected by an

How to MILL and RELIEVE

Precision Threads in ONE OPERATION





THREAD MILLING, once considered a fairly "rough" method of cutting threads, today competes with thread grinding on the highest precision jobs, with the added advantage of vastly greater production speed.

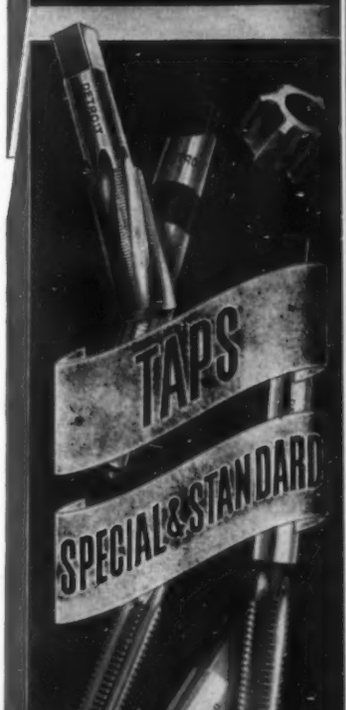
Much of this is due to the accuracy to which "Detroit" multiple thread milling cutters are ground.

And now you can even relieve the ends of the threads while milling the threads, thereby facilitating assembly, reducing chance of thread damage, etc.

To do this, "Detroit" thread milling cutters, for both Buttress and National thread forms, are available with plain cutting ends on either one end or both.

In operation, as shown in the diagram, the feather edge of the thread is removed by the right hand part of the milling cutter, while the left hand end of the cutter mills the end of the shaft down to the base of the thread so that no thread is cut on the extreme shaft end.

Detroit Thread milling cutters are available for internal and external milling and both shell and shank types. They are today's standards in the aircraft industry where high precision and long cutter life is required.



DETROIT TAP & TOOL Company 8432 BUTLER DETROIT

axle through the side plates of the unit frame while the horizontal unit is made of a wheel and link, the wheel bearing on the inside of the track when rolling around a horizontal curve. The vertical wheel units carry the load, ride the bottom of the track on horizontal runs, roll under the top of the track on vertical curves, turning upward or straightening out from downward to horizontal movement. The two sets of wheels keep the chain assembly in the centerline of the track. The conveyor will handle 65 lb. per ft. of length in single suspension and 125 lb. with double.

Acromark Hercules Holder Does Part Number Stamping

An assortment of marking tools for marking various shapes and sizes of machine parts has been announced by the Acromark Corp., 9-13 Morrell St., Elizabeth, N. J. Among the tools are fixtures, gage forms, type holders, graduation stamping die, bench marking machine and mandrels.

The Hercules holder, for both press and hand use, permits assemblies of interchangeable steel type for parts number stamping. The bench marking machine with mandrels has a Hercules holder mounted horizontally so that by interchanging the various sizes of mandlers several sizes of cylindrical parts can be marked around the periphery. The heavy duty steel stamping die engraved with graduations and numbers is useful in a punch press for stamping dials instead of using a milling machine, thus freeing that machine for other skilled work.

NEW MATERIALS

Durez Plastic Designed to Meet Special Impact Needs

A high-impact plastic of the phenolic type has been announced by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y. It has a macerated fabric filler and impact strength of 2.0 and specific gravity of 1.44. It is said to have a good cure cycle for material of this type, and is available in black and brown. Durez 11934 is claimed to meet special impact requirements for such applications as small pulley wheels, casters, and rollers.

Magnolia Metal Substitutes Two Lead-Base Bearing Metals

Two lead-base bearing metals, known as Pyramid and Defender, have been developed by the Magnolia Metal Company, 120 Bayway, Elizabeth, N. J., as substitutes for tin-base babbitts which are now difficult to secure.

Pyramid metal is well suited to applications where bearings must withstand heavy sustained pressures, such as are found in marine reciprocating engines, water turbines, paper mill calendar stacks and rolling mill machinery.

Defender metal stands shocks without cracking and is well suited for use in internal combustion engines, trap rock crushers and sifter machinery.

Spattered Molten Particles Removed by Turco Weldmask

Turco Weldmask, a creamy white liquid which prevents spattered molten particles from becoming attached to welded surfaces, has been announced by Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif. It is applied with a brush to the area most likely to be spattered by welding, usually about three inches on each side of the joint. Welding may be done through the liquid and the residue and molten particles can be removed with a hand wire brush and water. The liquid is non-inflammable, non-injurious to the skin, does not evaporate or give off fumes and can be used on steel, stainless steel, aluminum or magnesium. Since it does not dry on the work, it can be applied immediately or several hours before welding. This liquid is soluble in water and no inflammable solvents are required for its removal.

'Valdura Singlekote' Paint Combines Three Coats in One

A paint that primes, seals and finishes on any interior surface in one coat, designated as "Valdura Singlekote" has been announced by American-Marietta Co., 43 E. Ohio St., Chicago, Ill. The paint is intended for maintenance painting of industrial properties. It combines the economy of water-type paints with washability, durability and performance of oil-type coatings, and may be applied to surfaces previously coated with calcimine or casein paints, providing the old covering is bonded or tight to the wall. Dark surfaces may be covered with a single coat. It sets within two hours and dries within 12 hr. Although available only in white, it may be tinted with alkali-resistant colors in oil.

Oakite Develops New Anodic Degreasing Compound No. 90

Specially designed to meet war demands for faster cycles in anodic degreasing or reverse current cleaning of cold rolled steel parts before finishing, an alkaline-type material known as Composition No. 90 has been announced by Oakite Products, Inc., 24 Thames St., New York, N. Y. Due to its high conductivity, ready adaptability to hard water conditions, effective smut-removing properties and fast wetting-out action, the material is said to remove oil, grease, smut, polishing and buffing compounds on the consistently thorough, speedy basis required where a large volume of work is handled and where fast, effective soil removal is essential. The material, it is claimed, has been found particularly advantageous to plating departments and contract finishing shops using the Bullard-Dunn process for the tin coating of steel parts.

TRADE PUBLICATIONS

ARC WELDING The "Fleet-Fillet" technique of arc welding is described and illustrated in an 18-page bulletin published by The Lincoln Electric Co., Cleveland, Ohio.

BELTING "Care and Maintenance of Conveyor and Elevator Belting," a 24-page Catalog Section, No. 2800, issued by The B. F. Goodrich Co., Akron, Ohio, contains instructions for the care and maintenance of belting and a wide range of belt data, valuable when considering installation or repair problems.

COATING The Jetal process and its characteristics as a protective coating is described in a booklet published by Alrose Chemical Co., Box 1294, Providence, R. I.

COLLOIDAL GRAPHITE Technical bulletin No. 230.8, covering current revised standard dispersions of "dag" colloidal graphite in various carriers has been issued by Acheson Colloids Corp., Port Huron, Mich.

CUTTING The No. 425 Cutalator is illustrated and described in a four-page leaflet issued by Andrew C. Campbell, Division of American Chain & Cable Co., Inc., Bridgeport, Conn.

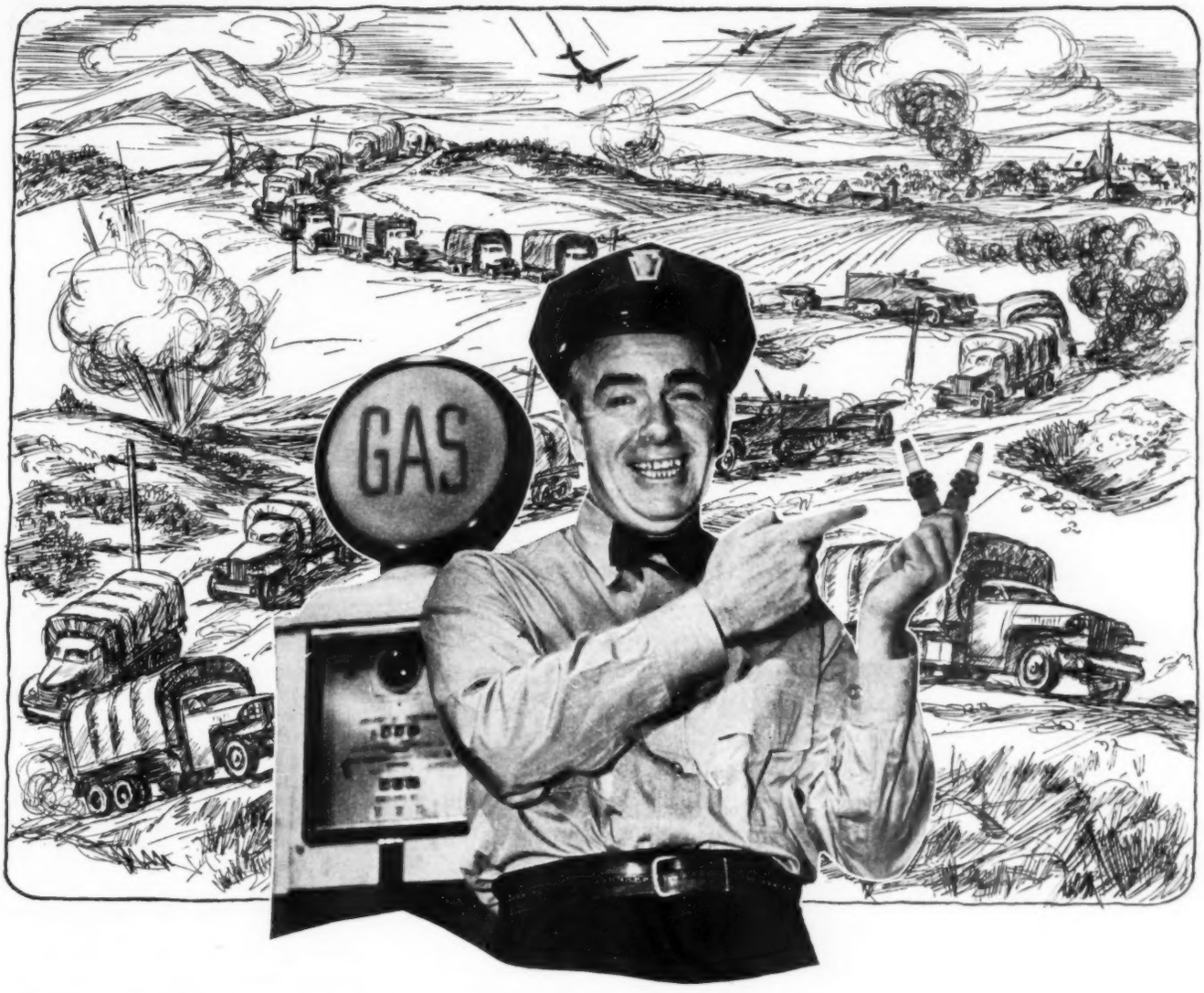
CUTTING OILS Available to production men in metal working plants, a 32-page booklet, the text of which is supplemented with many illustrations, diagrams and tables, has been published by the Gulf Oil Corp., Gulf Building, Pittsburgh, Pa.

DIAMOND TOOLS "The Care and Maintenance of Diamond Tools," a 24-page, illustrated booklet, has been prepared by J. K. Smit & Sons, Inc., 157 Chambers St., New York, N. Y.

DIE CASTING Saving metals, machines and manpower for victory with die castings is the subject of a booklet put out by the Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.

DUST COLLECTOR Mechanical features and specifications of the high efficiency Cyclone dust collector are given in the profusely illustrated catalog No. 82 published by the American Foundry Equipment Co., 555 S. Byrkit St., Mishawaka, Ind.

ELECTRICAL EQUIPMENT A copy of the 64-page, 1942 "Quick Selector Cata-



The spark plugs Eddie doesn't sell will help smash the Axis

"You know how it is when a spark plug in your car stops firing? Seems to drain all the power from your engine. It's the same way in an airplane or tank. And for each plug in your engine a bomber has a dozen. By taking good care of my customers' plugs I not only save them gasoline and money, but I also save a lot of plugs for use on Schicklgruber."

When Uncle Sam stopped the manufacture of cars for general use, he did more than change the greatest automobile plants in the world into arsenals for tanks and planes. He also released the giant facilities of the spark plug manufacturers for the making of war materials. But in giving these firms new things to make and new alloys to make them of, he handed them new problems with every sheaf of blueprints.

In cooperation with the Revere Technical Advisory staff, leading spark plug manufacturers made the conversion smoothly with a minimum of headaches. For Revere not only supplies industry with sound copper alloys, produced with the help of the most exquisitely accurate instruments known to metallurgy, but also provides skilled assistance in the methods of processing and fabricating.

Copper is one of the most vital of all war materials. Every ounce goes directly into the essentials of modern warfare. Fortunately, Revere is well equipped, with modern plants, improved machines and advanced techniques, to supply a substantial part of our nation's mounting needs. And Revere research is continually exploring new frontiers in copper alloys to provide us all with stouter, keener, swifter tools for victory.

The Revere Technical Advisory Service functions in (1) developing new and better Revere materials to meet active or anticipated demands; (2) supplying specific and detailed knowledge of the properties of engineering and construction materials; (3) continuously observing developments of science and engineering for their utilization in production methods and equipment; (4) helping industrial executives make use of data thus developed. This service is available to you, free.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK

HERE'S YOUR COMPETITION TODAY

The ENEMY is our competition today. Our competitors are Germany, Japan and Italy. *And unless we lick that competition we will never again be free to compete with each other.*

We've got to meet this stiffest of competition on two fronts . . . the fighting front and the production front. Co-ordination of the highest order must be applied to the job.

To back up our men who will do the real fighting, we must make maximum use of all essential materials and of every production facility which we have behind the lines.

We must use every man not needed in the fighting forces—and women, too. Older men, now retired, must come back to the job. We must use old machinery as well as new, small plants as well as large, 24 hours a day, seven days a week.

Remember, there's a shortage of time . . . we have no surplus of skill in management and labor . . . no surplus of materials. It will take *all* of these we have.

Geo. P. Trundle Jr.

P. S. Today it's 100% war work for every consulting management engineer on our staff.

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log 30-000," designed to simplify the selection of many types of electrical equipment, may be secured from Department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

ELECTRICAL EQUIPMENT "List of Inspected Electrical Equipment May 1942," including all listings up to May 1, 1942, has been prepared by Underwriters' Laboratories, Inc., 207 East Ohio St., Chicago, Ill.

FINISHES A booklet published by Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J., provides makers of armament products with essential information on finishes made to conform with various U. S. Government specifications.

GAS EQUIPMENT A 32-page catalog published by Charles A. Hones, Inc., Baldwin, N. Y., shows "Buzzer" industrial gas equipment and burners.

GAS UNIT HEATERS A folder illustrating and describing installation of suspended gas unit heaters is obtainable from Reznor Mfg. Co., Mercer, Pa.

GENERATORS Four revolving field generators are described in a four-page folder issued by Century Electric Co., 1806 Pine St., St. Louis, Mo.

HEAT TREATING "A New Method of Heat Treating Tool Steels" is the title of a leaflet describing the Tuff-Hard patented process of heat treating high speed cutting tools.

HYDRAULIC JACKS Independent-pump jacks, vertical outside-pump jacks and horizontal outside-pump jacks are illustrated and described in a four-page bulletin issued by Watson-Stillman Co., Rosella, N. J.

INDUCTION HEATING Data sheets covering the subject of induction heating are issued monthly by the Induction Heating Corp., 389 Lafayette St., New York, N. Y.

LIFT TRUCK Automatic Transportation Co., Div. of The Yale & Towne Mfg. Co., Chicago, Ill., offers a folder illustrating and describing the "Transporter" lift truck with control in the steering handle.

MAGAZINE "Sterling Sparks" is the title of the magazine issued by The Sterling Grinding Wheel Division, Tiffin, Ohio.

PLATING CONVEYOR Bulletin SA-101 of the Hanson-Van Winkle-Munning Co., Matawan, N. J., contains illustrations and detailed descriptions of the construction and improved features of semi-automatic heavy duty plating conveyors.

POWDER METALLURGY A 48-page, illustrated catalog, No. 41-T, published by the F. J. Stokes Machine Co., Phil-

adelphia, Pa., gives a complete picture of the broad application of tabletting or compressing and fully describes the equipment used in this modern process.

RECORDERS Micromax speed recorders are described in a 12-page catalog, N27, offered by Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia, Pa.

SAFETY Goggles, protective clothing for welders, and respirators are described in booklets prepared by Pulmosan Safety Equipment Corp., 176 Johnson St., Brooklyn, N. Y.

STEEL PRODUCTS The American Iron and Steel Institute, 350 Fifth Ave., New York, N. Y., has revised the "Steel Products Manual" which includes sections on "Carbon Steel Semi-finished Products" and "Standard Steels Including Limits and Ranges for Non-Standard Steels."

THREADED PARTS A data sheet, "A Few Important Suggestions on the Design of Threaded Parts," has been prepared and is offered by the die head manufacturers.

Extinguishing Magnesium Fires

Magnesium shavings, turnings, borings, and powder are so inflammable that they can be ignited readily by small sparks and flames. In fighting a magnesium fire, it is important to know what not to do. Disturbing the fire violently by any means usually will cause it to spread and may result in an explosion. Application to magnesium fires of water, carbon tetrachloride, carbon dioxide, foam and other common extinguishing agents usually increases the rate of burning; in some cases use of these agents may result in violent explosions, or in the emission of toxic or hazardous gases.

When a coarse spray of water is directed onto burning magnesium, the fire becomes more intense and the magnesium burns out in one-fourth to one-half the time. A strong stream of water from a hose or a flow of water along the surface on which the fire rests usually will cause an explosion. All materials used for partial sealing should be thoroughly dry and should not contain combined water that can react with the magnesium. The fire is checked by carefully covering the burning magnesium with dry sand, graphite, cement or other similar substances.

If a magnesium fire is covered with some material that will soften in the heat, flow over the burning mass, and cling to it, a completely airtight covering is made that stops combustion quickly, and permits fairly rapid cooling. If the fire can draw air or moisture from below, a layer of the material must be worked under the fire. Materials which can be used for completely sealing burning magnesium,

Switch to

NE Alloy Steels

to Save Critical Metals

TO HELP conserve nickel, chromium, vanadium and other scarce metals, the War Production Board's ablest metallurgists have developed NE (National Emergency) Alloy Steels. These new steels contain relatively small quantities of alloying elements in such combination as to produce physical properties usually attributed to steels of much higher alloy content. The War Production Board stipulates the use of the new NE Alloys to *replace* the standard SAE and AISI Alloy Steels for a wide range of applications.

Ryerson NE Alloy Steel stocks in six specifications, all fine grain, will be available shortly; and will consist of sizes ranging from ½-inch to 7 -inch rounds, in three groups:

Carburizing Grades
NE 4023 and NE 8620.
To Replace AISI and SAE
Nos. A 2300, A 2500, A 3100, A 4100, A 4600, A 5100, A 6100

Medium Hardening Grades
NE 4042 and NE 8744.
To Replace AISI and SAE
Nos. A 2330-35, A 3130-35, A 4130-35, A 5130-35, A 6130-35.

High Hardening Grades
NE 4047 and NE 8749.
To Replace AISI and SAE
Nos. A 2300, A 3100, A 3200 A 4100, A 4600, A 6100

Only limited data on heat-treatment response or physical properties will be available when NE Alloys are first ready for shipment. The WPB is anxious to know how these new steels will function and requests all NE Alloy users to report results in working with these new steels. Ryerson will cooperate fully with users, supplying laboratory test data, and all other available information.

• • •

If you now use Alloy steel, let Ryerson help you in adapting NE Alloys to your requirements wherever possible. Write, wire or phone the nearest of the ten Ryerson plants.

JOSEPH T. RYERSON & SON, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

RYERSON STEEL-SERVICE

Stuart's Cutting Oil Service will help you get the most out of *Minutes, Metals* and *Machines*

OUR job is to keep cutting oil research and engineering service abreast of the progress made in machines, tools, metals and processes; to make sure the metal working industry has every advantage that modern cutting oils can make possible.

We've done that job since 1865 — done it well, industry has acknowledged.

Example after example can be cited where management and technicians of vital war products plants, government and private, have worked with Stuart Oil Engineers to solve new and difficult problems that were barriers to peak production. The key to every such solution has been found in an open-minded approach — close cooperation — in using unbiased judgment — and a determination to achieve results.

This is why we feel that you will find Stuart Oil Engineering Service helpful in solving metal cutting problems. It has been our job since 1865.

Stuart's CODOL
LIQUID GRINDING COMPOUND
Meets every test for the ideal Modern Grinding Compound

Stuart's Thred Kut
PAT'D U. S. PATENT OFFICE
HEAVY DUTY CUTTING OIL
Recommended by America's leading machine tool builders

Stuart's SOLVOL
LIQUID CUTTING COMPOUND
For carbide tools and where an "aquamix" solution is recommended

Stuart's "SUPER-KOOL"
AMERICA'S FIRST TRANSPARENT SULPHURIZED CUTTING AND DRAWING OIL

For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

chips and shavings include certain grades of hard pitch derived from coal tar, water-gas tar, and petroleum asphalt.

To be usable, hard pitch derived from coal tar must be of the type called "very hard" and have a softening point not much less than 300 F. The lump pitch is crushed to a size where not less than 98 percent of the product will pass a U. S. No. 6 sieve, and 90 percent or more will be retained on a U. S. No. 40 sieve. Flaked pitch may be used without crushing, provided (1) few if any flakes have an area greater than 1 sq.in.; (2) the flakes are not thicker than ⅛-in., and (3) 90 percent or more of the pitch will be retained by a U. S. No. 40 sieve. Because of the shape of individual particles, flaked pitch can be used with a larger maximum size than granulated pitch. It will act a little slower, but not enough to be a drawback.

Hard petroleum asphalts meeting the specifications given above for pitches derived from coal tar can be used, and will extinguish a magnesium fire effectively, but certain drawbacks are connected with their handling. Petroleum asphalts must not be confused with petroleum cokes. Hard petroleum asphalts of the same softening point contain more volatile matter than do the corresponding hard pitches derived from coal tar, and the finer sizes are more inflammable. At summer temperatures the individual particles of petroleum asphalts tested so far have a strong tendency to stick and coalesce after a period of standing; this could render the material useless in time of emergency. If hard petroleum asphalts are used, the crushed material should be stored in relatively shallow containers so that the weight on the bottom particles will be reduced.

Other pitches, such as hard pitch derived from water-gas tar, appear to have possibilities, provided they meet the specifications given above. However, no large-scale tests of them have been made. Hard pitch derived from water-gas tar was satisfactory in laboratory tests.

In plants where water and abrasive materials may damage machinery it is preferable to use pitches on magnesium fires. To extinguish a magnesium fire on metal or dry concrete surfaces, or on dry ground, the procedure is simply to spread (not throw) with a long-handled scoop or shovel a layer of pitch over the burning metal. The pitch softens and seals the fire. If, after the first application, the pitch tends to burn with a short flame, this can be stopped by applying a second thin layer of pitch over the flaming parts. Some time smoke will issue from the hot mass for several minutes but no reignition will result.

After the fire is extinguished the mass should be allowed to cool for a reasonable time (5 to 10 min. is enough for small fires) after which the pitch covering can be removed from the magnesium. If the fire is discovered early and the pitch is applied properly, most

of the magnesium will be recovered before it is consumed. If the pitch is allowed to cool until it is quite hard, it should be chipped off the underlying metal or other surface; on machine beds, bronze or other soft tools should be used for this purpose.

The procedure to be followed in extinguishing magnesium fires on wood floors (or on wet ground) is as follows:

Apply a small quantity of pitch over the fire to reduce the heat and glare. Then spread a layer of pitch approximately 1 in. thick on the floor alongside the fire and carefully transfer the burning mass onto the pitch with a shovel or hoe. Finally, cover the entire surface of the fire with more pitch, and also scrape away any burning particles or embers from the floor at the initial location of the fire. If, by the time the fire is discovered, the wood floor is badly scorched or burning, then, after the above steps are taken, apply water to the burning wood to prevent the spread of the wood fire. In so far as possible, in shops with wood floors where magnesium is being processed or handled, care should be taken that metal pans are kept under machine beds so that accumulations of magnesium chips or powder collect in the pans and not on the floor.

Approximately 2 to 3 lb. of pitch is required per pound of magnesium chips or turnings to extinguish a fire promptly. The pitch can be stored at strategic points in lots of approximately 25 lb. This can be put in a 5-gal. pail. A long-handled shovel should be kept with each container.

Abstracted from a circular letter on "Methods of Extinguishing Magnesium Fires and Incendiary Bombs Composed Mainly of Magnesium" issued by Central Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pa.

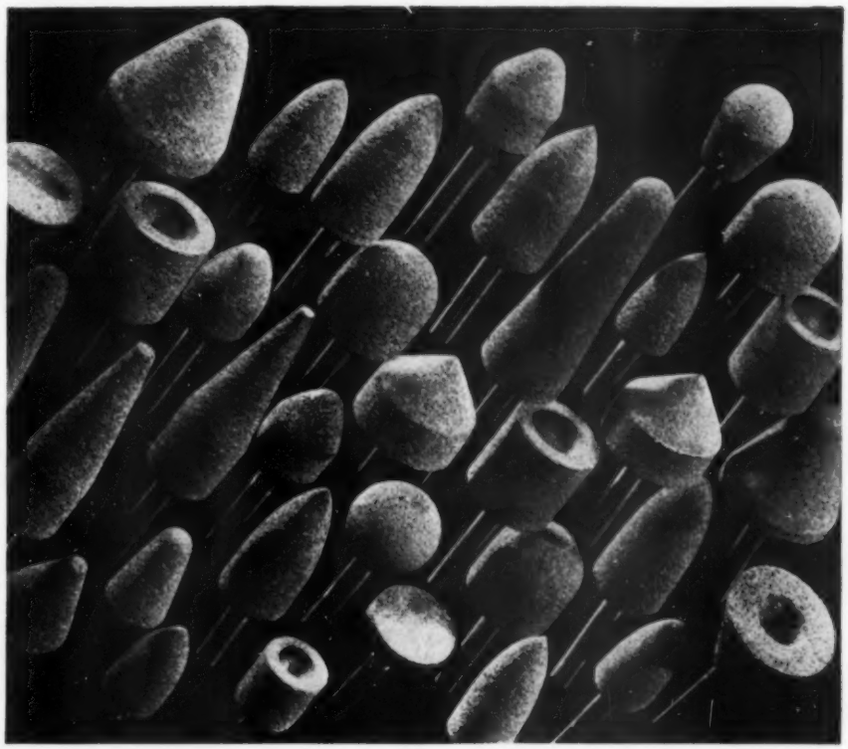
Tires Made to Stretch

With distances vast and tire mileage waning, Southern California aircraft workers face a transportation problem in the near future. Company newspapers offer a partial solution by conducting "Rides Offered" and "Rides Wanted" columns, just like the classified ads in daily papers.

For instance, the *Northrop News*, in a recent issue offered 86 rides and asked for 95. Each ad gives the starting point, name, department and shift number, and in the case of "Rides Offered," the route followed on the way to work and the number of passengers that can be accommodated.

With payrolls mounting to tens of thousands, the plan seems to be the only feasible way of getting driver and rider together. The rider pays his share of the car operating cost; in many instances, drivers will use their cars jointly on a planned schedule. Most important is the fact that tire mileage is stretched as far as possible.

FINISHING THE *JOB* BEHIND THE LINES



Keeping up with Uncle Sam's victory drive for more tanks and guns and planes, Chicago Mounted Wheels are doing a big finishing job in shops everywhere—taking care of every kind of delicate or tough grinding job faster, smoother and better.

CHICAGO MOUNTED WHEELS

Made of V/T Super Bond, they have real stamina, give unmatched performance and last 150% to 300% longer than ordinary wheels.

Chicago Wheels were the first small wheels mounted on steel shanks. Today there are over 200 different shapes to serve you—made in a variety of abrasives, grains and grades, mounted on shanks of various lengths and diameters of 1/4", 3/32", 1/8" and 3/16".

TRY ONE ABSOLUTELY FREE

Tell us the kind of job, size and wheel speed you use, and we'll send you a test wheel postpaid.

BRAND NEW CATALOG—Just off the press, this book is prepared in the modern manner—loads of illustrations, concise descriptions of the complete line of Chicago Mounted Wheels.

HI-POWER GRINDER

A real production grinder that is saving many man hours. Weighs 3 pounds, yet is so well balanced that fatigue is practically eliminated. Has enough power to drive a 2½" diam. wheel. Speed 17,000 r.p.m. In case with 3 Chicago Mounted Wheels, Drum Sander and Bands, extra Collets, Wrenches, Dressing Stone, $38.50.

CHICAGO WHEEL & MFG. CO.

Makers of Quality Products for 40 Years

1101 W. Monroe St., Dept. AT, Chicago, Ill.

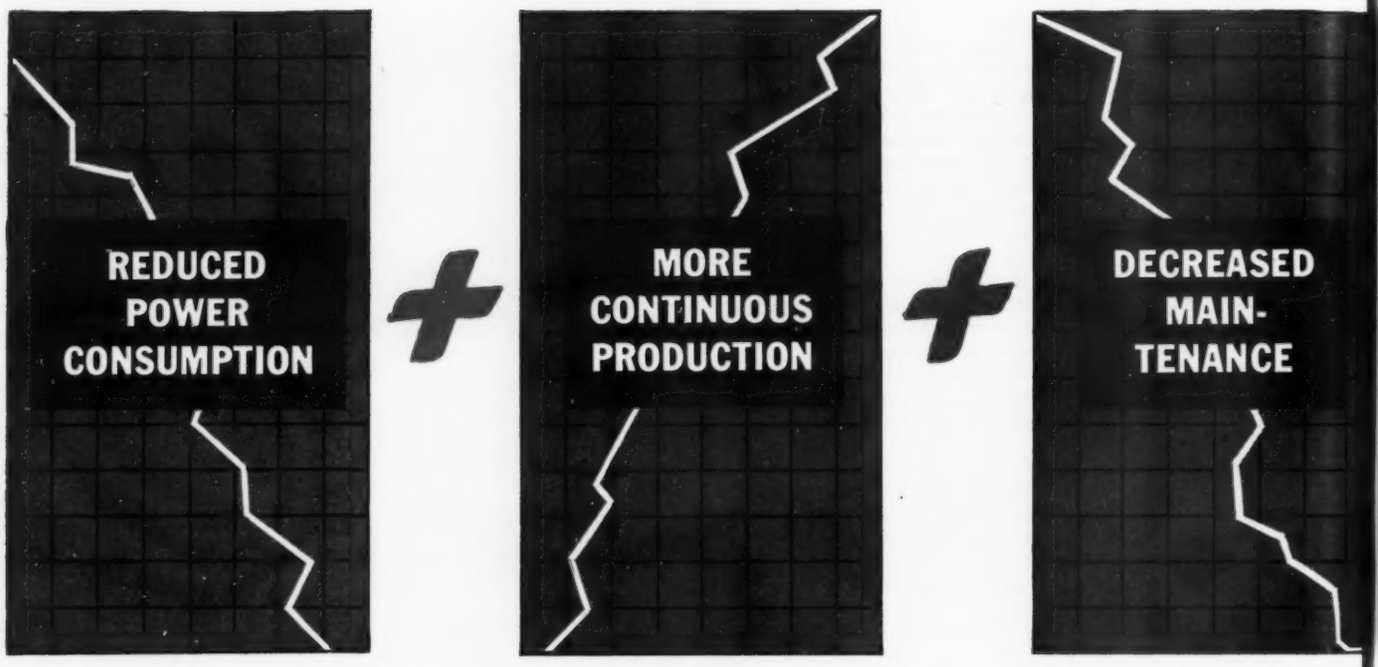
☐ Send Hi-Power Catalog
☐ Free Wheel Size .....

Name .....

Address .....

SOCONY-VACUUM'S FAMOUS LUBRICATION

Capacity



The "4-Factor" Story proved in Peacetime—Now vital in Wartime

GARGOYLE Lubricants

NEVER BEFORE IN U. S. A. HISTORY has there been such grim, absolute necessity for Correct Lubrication. It's a keystone in our Battle of Production. Without it no plant can achieve full efficiency.

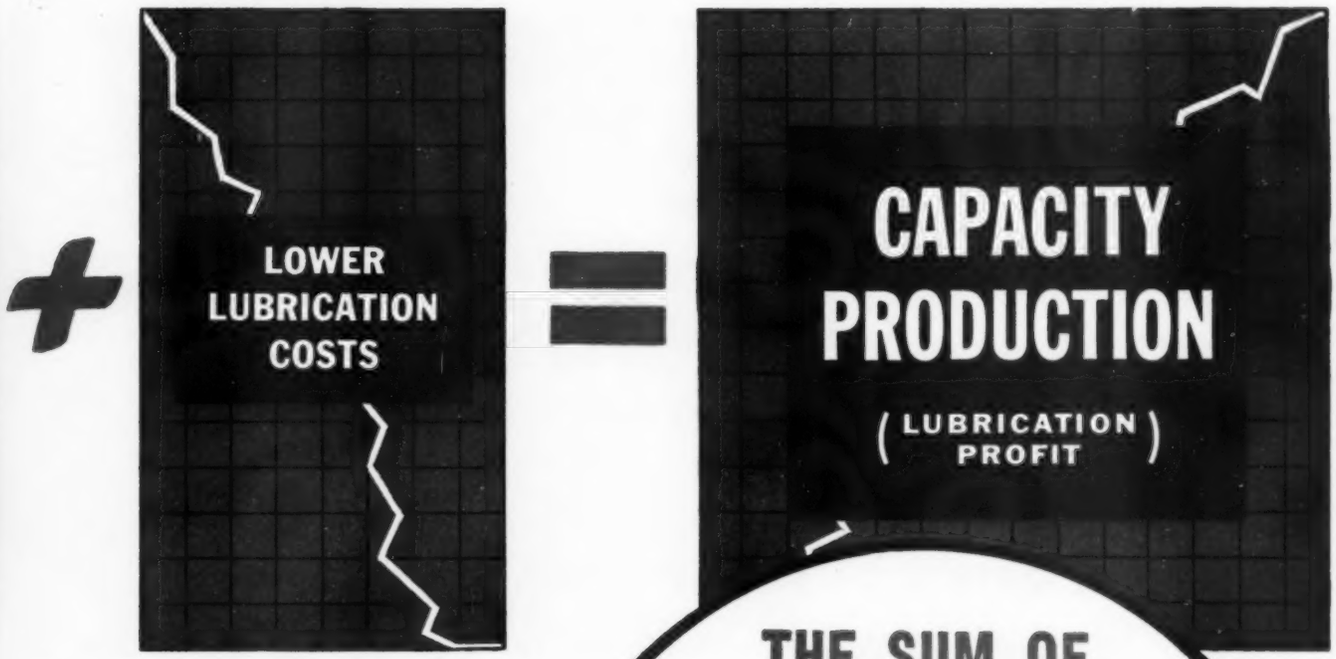
For years Socony-Vacuum—*the first to present and apply the principle of Correct Lubrication*—has been proving to management that it results in 4 savings which add up to a Lubrication Profit. Today, this Lubrication Profit pays off in Capacity Production!

If you are interested in results, talk this over with the Socony-Vacuum man. Backed by 76 years' experience, no one in the lubrication field is better equipped than he to give you the results you want!

CALL IN SOCONY-VACUUM FOR CORRECT

PROFIT NOW PAYS OFF IN..

Production!



Socony-Vacuum's 4-FACTOR STORY is a Famous guide for operating men throughout U.S.A. Industry

THE SUM OF THESE FOUR SAVINGS

4

1. REDUCED POWER CONSUMPTION
2. MORE CONTINUOUS PRODUCTION
3. DECREASED MAINTENANCE
4. LOWER LUBRICATION COSTS

=LUBRICATION PROFIT

SOCONY-VACUUM OIL CO., INC. • Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. • White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) Magnolia Petroleum Co. • General Petroleum Corp. of Calif.

LUBRICATION

FASTER DRIVING • LESS EFFORT • BETTER WORK
= 50% LESS ASSEMBLY COST WITH PHILLIPS SCREWS

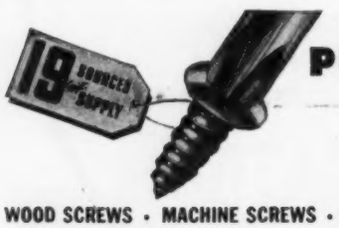
It seems reasonable to expect more production and better work from a man who doesn't have to sweat and strain (and curse) in order to drive a screw.

Plants which have switched over to Phillips Recessed Head Screws do find that quantity and quality both respond nicely to the change. The Phillips Screw clings to the driver, transmits driving power more efficiently, prevents screw-driver slippage, drives straight automatically and doesn't chew up when you start to drive it home. On top of that, it is more often practical to use electric or pneumatic drivers.

With so many nuisances and strength-wasters eliminated, operators do better work, even in awkward positions or even if inexperienced. Where accuracy is important, it is easier for them to line the job up right — seat the screws securely — and avoid costly rejects.

So keep your men cool as cucumbers with Phillips. Meanwhile, you'll be pleased as Punch to find that assembly costs are cut in half as a result of Phillips Screws.

Any of the Phillips Recessed Head Screw manufacturers listed below can furnish screws and facts.



PHILLIPS RECESSED HEAD SCREWS
GIVE YOU 2 for 1 (SPEED AT LOWER COST)

WOOD SCREWS • MACHINE SCREWS • SHEET METAL SCREWS • STOVE BOLTS • SPECIAL THREAD-CUTTING SCREWS • SCREWS WITH LOCK WASHERS

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

For the Ladies (BLESS 'EM!)

1917

25 YEARS OF STANDARDIZING ON COLONIAL 14

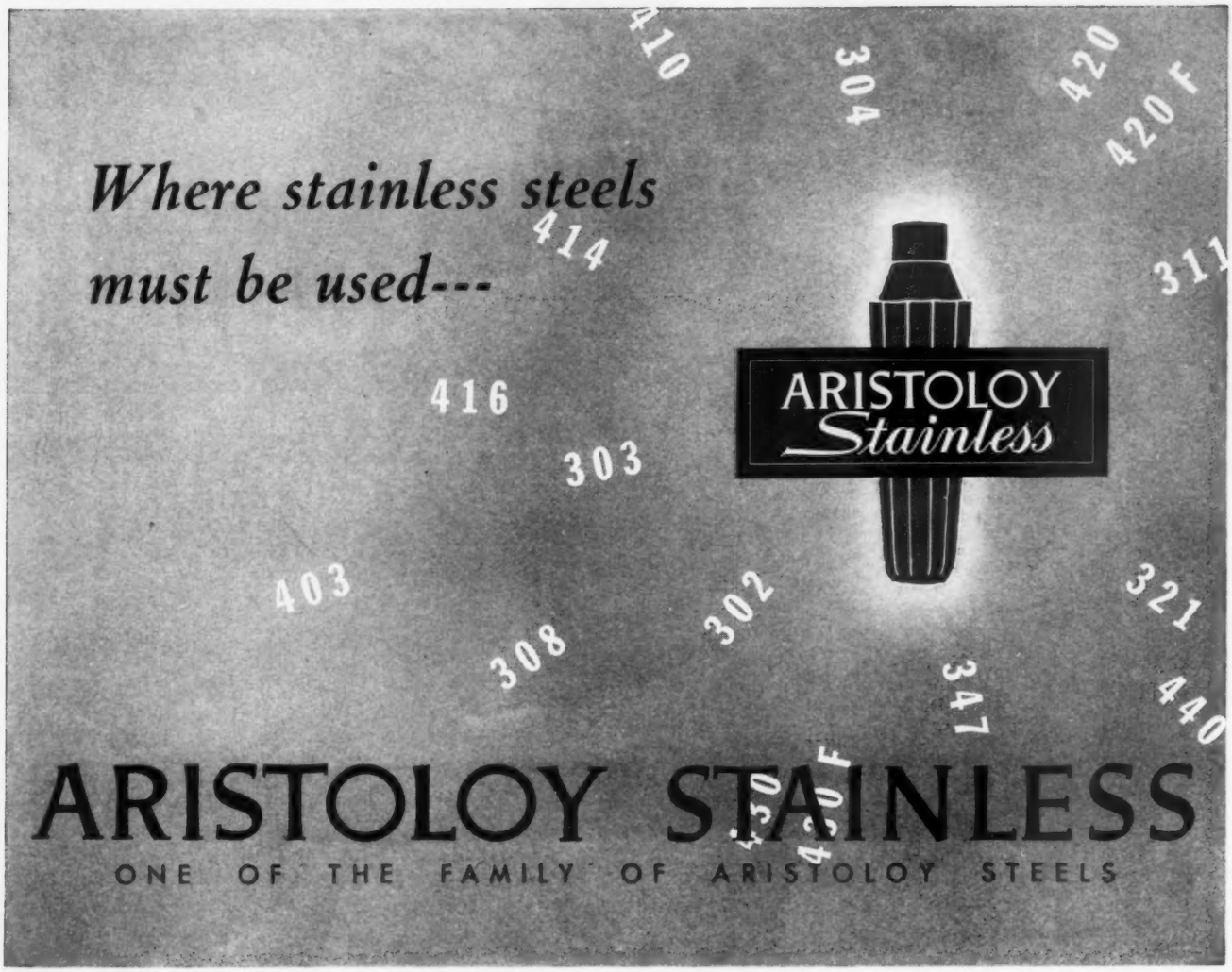
FOR A VERY PARTICULAR DIE APPLICATION!

1942

• For a quarter-century this customer has specified COLONIAL 14 for his fine hand-mirror dies in preference to any other carbon steel—because Colonial's uniform structure, hardness, and freedom from distortion do a completely dependable job!

TOPS IN TOOL STEELS

Vanadium-Alloys STEEL CO. LATROBE, PA.



To conserve nickel and chromium, all industry is cooperating to limit the use of stainless steels to vital applications where only stainless will do the job. For such applications Copperweld Steel Company is furnishing Aristoloy Stainless steel bars and billets. We'll be glad to discuss your stainless steel applications with your engineering staff.

COPPERWELD STEEL COMPANY **WARREN, OHIO**

Giants

★ William Sellers & Company, in their ...ng history, have built machine tools for the ...eds of four major wars. ★ The experience ...f this organization in designing and build-...g special machinery to unusual dimensions ...as always been placed at the disposal of ...hose governmental departments and officials ...harged with securing the greatest possible ...utput of the weapons and munitions of war.

...LIAM SELLERS & CO., Inc. • 1600 Hamilton St. • Philadelphia, Pa.

FOUNDED SELLERS 1848

Sellers

Ideas that dare are the Ideas that lead

You never could keep out in front by doing "business as usual." This is truer today than ever before. War production calls for daring new ideas, daring new methods.

But to be successful, pioneering must be done with judicious daring—not reckless abandon.

Through practical pioneering, Shell has won the confidence of busy production executives. And Shell's improved method of balanced tool lubrication is helping today's hard-pressed manufacturers get increased production, longer machine and tool life, improved finish.

Are <u>your</u> cutting oils tuned to the increased tempo of today's machines? Call Shell and be sure!

SHELL LATA OILS *for Cutting*

SHELL

To help rookie industries become veterans in the battle of war production

Here, Machining is a High Speed Operation

MACHINING Magnesium Alloys *can be* a high speed operation. Tell your machine operators how to take full advantage of the excellent machinability of Magnesium and you've given war production a mighty big boost forward.

On this card, American Magnesium Corporation lists many of the things that machine operators should know We'll gladly send you copies for posting in your plant Write Aluminum Company of America, Sales Agent for Mazlo Magnesium Products, 1709 Gulf Building, Pittsburgh, Pennsylvania

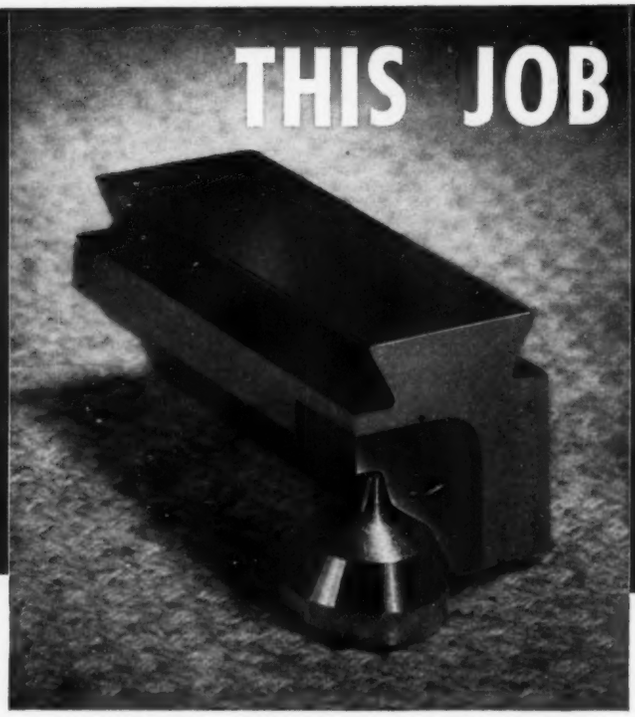
AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

MAZLO MAGNESIUM PRODUCTS

THIS JOB

Cemented-Carbide Tipped



Originally, these spray tips for Diesel injectors were formed with steel tools. Because of the constant wear on the tools, considerable difficulty was encountered in holding the form. In addition, it was necessary to polish the parts to secure the proper finish.

Carbide Fabricators have produced the cemented-carbide tipped tools now being used for this job. Tool replacement has been reduced tremendously... production of accurately formed parts has been greatly increased... and the forming operation alone provides the desired finish.

In your manufacturing operations, there undoubtedly are many jobs on which Carbide Fabricators special cemented-carbide tipped tools will produce parts faster and more accurately. Their exceptional economy in use has been proved many times over on high production work. Your inquiries regarding prices and deliveries will receive prompt attention. Blueprints should accompany each inquiry.

CARBIDE FABRICATORS PRODUCE A WIDE VARIETY OF SPECIAL CEMENTED-CARBIDE TIPPED CUTTING TOOLS AND OFFER A COMPLETE LINE OF STANDARD TOOLS.

CF *Carbide Fabricators* BERKLEY MICHIGAN

DIVISION OF MORSE TOOL COMPANY . DETROIT

DOW

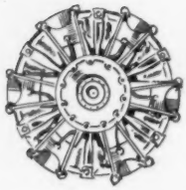
POWER—SPEED—in greater measure for transportation—everywhere freedom from hampering weight—visioned by the designer with an eye to the future—millions of pounds of phenomenally light magnesium now drawn by Dow from ocean water for our victory drive—vast quantities ready for the faster, freer tempo of life—in industry, on the farm, in the home—when peace is won.

THE DOW CHEMICAL COMPANY
MIDLAND, MICH.

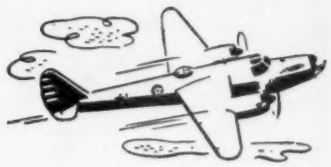
TRADE DOWMETAL MARK

MAGNESIUM

The Lightest Structural Metal . . . One-third Lighter Than Any Other in Common Use



WANTED



50 PRODUCTION EXECUTIVES

Must be top-flight men of proven ability, capable of directing the many divisional operations of one of the world's largest aircraft-engine plants.

The Dodge Chicago Plant, division of Chrysler Corporation, now being built in the Chicago area, wishes to have associated with it a large group of men who have demonstrated their specialized talent, executive ability and high character.

The contract held by Chrysler Corporation for the production of aircraft engines is an outstanding commitment in the war program. It requires doing another high-precision job on a mass-production basis.

This gigantic plant will be one of the world's largest under one roof. Machine tools, equipment and facilities will be the finest and most modern. The personnel must measure up to the same high level of individual efficiency.

This war project demands executive supervision of men, materials and machinery on a scale heretofore unknown in industry. The Dodge Chicago Plant, division of Chrysler Corporation, is determined, therefore, to select as executives men who can guarantee the performance required by patriotic necessity and exacting manufacturing standards.

The Production Executives chosen for this painstaking task must be experts, backed by years of proven skill—both technical and managerial. Thousands of able Americans will work under their direction in round-the-clock shifts. Thousands of precision instruments and production tools will be the responsibility of these top men. That is why they all must be exceptionally good!

EXECUTIVES WANTED FOR THE FOLLOWING DIVISIONS—

ALUMINUM FOUNDRY
MAGNESIUM FOUNDRY
FORGE
HEAT TREATING & PLATING

MACHINE SHOP:
Crankcase · Crankshaft
Connecting Rod & Piston
Cylinder Head & Barrel Assembly
Gear Cutting · Precision Parts

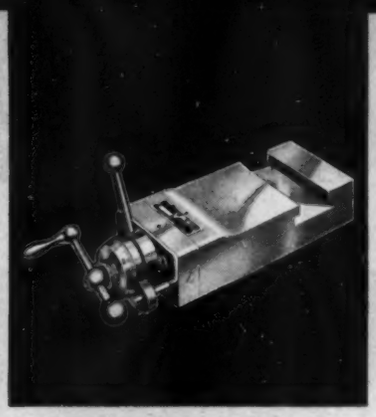
ASSEMBLY & RE-ASSEMBLY
INSPECTION
WORKS ENGINEERING
MASTER MECHANICS

NOTE: *Here is an unusual opportunity for men who are eager to become affiliated with a large organization engaged in the production of vital war materials. Give age, qualifications and salary expected. Proof of citizenship required. All correspondence will be kept confidential. Appointments will be made for personal interviews at your convenience. Address your application to Box 284, care of this paper.*

DODGE CHICAGO PLANT

Division of CHRYSLER CORPORATION

CIRCULAR DIVIDING ENGINE—Accurately divides circular discs into predetermined divisions.



LATHE COMPOUND—For 10-inch South Bend. Quick drawout. Increases thread chasing output 40%.

CIRCULAR THREAD CHASER—Chases threads on lathe work more rapidly and accurately than single point tools.

EXTERNAL COMPARATOR STAND—Rapidly checks outside diameters to close tolerances. Rugged.

TRI-ROLL GAGE—Efficiently measures male pipe threads. Longer lived than ring gages.

PRECISION PRODUCTION *Requires* PRECISION PRODUCTS

Pictured here are some of VARD'S precision-made inspection equipment and production tools which are helping this country's war-industry plants meet delivery dates and performance requirements. All VARD products conform to prevailing technical standards and represent the best in design, materials, and workmanship.

VARD INC. PASADENA, CALIFORNIA

SNAP GAGE—Rapidly checks the pitch diameter, thread form angle, and lead of work under inspection.

LOOK FOR THIS MARK VARD PASADENA, CALIF. *ON ALL VARD PRODUCTS!*

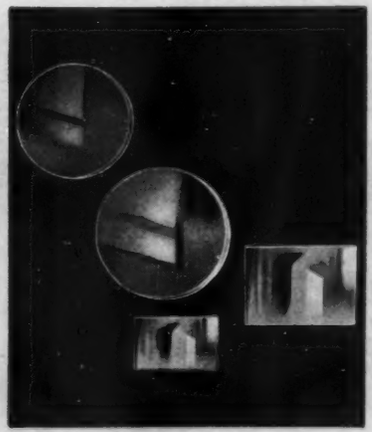
PIPE GAGES; PLUG AND PLAIN RING—Check pitch diameter, taper, and truncation of pipe threads.

PLUG THREAD GAGES—Check pitch diameter and major diameter of internal threads. Made in all sizes from No. 4 to 6-in.

TWO-PIECE TAPS—Made in larger than usual sizes to conserve high speed steel. Mild steel shank.

SPECIAL TAPS—Precision ground to narrow limits. Available also in special and left-hand threads.

OPTICAL FLATS—Precision made for testing flat surfaces and anvils on testing instruments.



FILTERS AND MIRRORS—Color filters for visual and photographic uses. High reflectivity mirrors.

LENSES AND PRISMS—Precision lenses and prisms for fire control, navigation, and other instruments.

OPTICOTE—Durable films applied to glass to reduce reflection and increase light transmission.

Are You Taking

SURFACE CUTTING SPEEDS FOR VARIOUS GRADES OF COLD DRAWN CARBON STEEL ON AUTOMATIC SCREW MACHINES

Speeds given below are approximate and are to be used only as a basis from which proper speeds for the part in hand may be calculated. These figures represent averages for the general run of parts made from cold drawn steel. Any extraordinary features in the part to be made should be taken into consideration and the speeds altered accordingly.

A.I.S.I. Number	Present S.A.E. Number	Former S.A.E. Number	Surface Feet Per Minute	% Relative Speed Based on A.I.S.I. B1112 (S.A.E. 1112)
C1006	.....	.....	110	66
C1008	1008	.....	110	66
C1010 (light feeds)	1010	1010	120	72
C1012	.....	.....	120	72
C1014	.....	.....	120	72
C1015	1015	1015	120	72
C1016	1016	X1015	130	78
C1017	.....	.....	120	72
C1018	.....	.....	130	78
C1019	.....	.....	130	78
C1020	1020	1020	120	72
C1021	.....	.....	120	72
C1022	1022	X1020	130	78
C1023	.....	.....	125	76
C1024	1024	.....	120	72
C1025	1025	1025	120	72
C1026	.....	.....	120	72
C1029 (light feeds)	.....	.....	120	72
C1030	1030	1030	115	70
C1033	.....	.....	115	70
C1035	1035	1035	115	70
C1036	1036	.....	105	64
C1040	1040	1040	105	64
C1042	.....	.....	105	64
C1043	.....	.....	105	64
C1045	1045	1045	95	57
C1045 Annealed	1045	1045	120	72
C1050	1050	1050	90	54
C1050 Annealed	1050	1050	115	70
C1052 Annealed	1052	.....	85	51
C1055 Annealed	1055	1055	85	51
C1060 Annealed	1060	1060	85	51
C1061 Annealed	.....	.....	85	51
C1064 Annealed	.....	.....	80	49
C1066 Annealed	1066	X1065	80	49
C1068 Annealed	.....	.....	80	49
C1070 Annealed	1070	1070	80	49
C1074 Annealed	.....	.....	75	45
C1078 Annealed	.....	.....	75	45
C1080 Annealed	1080	1080	70	42
C1085 Annealed	1085	1085	70	42
C1086 Annealed	.....	.....	70	42
C1095 Annealed	1095	1095	70	42
B1008	.....	.....	130	78
B1011	.....	.....	130	78
FREE CUTTING STEELS				
C1109	.....	.....	135	82
C1110	.....	.....	135	82
C1112	.....	.....	135	82
C1113	.....	.....	155	94
C1115	1115	1115	135	82
C1116	.....	.....	155	94
C1117	1117	X1314	140	85
C1118	1118	X1315	140	85
C1120	.....	.....	135	82
C1121	.....	.....	135	82
C1122	.....	.....	135	82
C1132	1132	X1330	125	76
C1137	1137	X1335	120	72
C1141	1141	X1340	115	70
C1144	.....	.....	120	72
C1217	.....	.....	140	85
B1110	.....	.....	140	85
B1111	1111	.....	155	94
B1112 (Union Free Cut)	1112	1112	165	100
B1113 (Union Supercut)	1113	X1112	225	136

REPUBLIC STEEL — PRODUCTION FOR VICTORY

REPUBLIC

FULL ADVANTAGE

OF THE

Uniform Machinability

OF UNION COLD DRAWN STEELS?

With wartime demands for mass production of duplicate steel parts becoming greater and more urgent day by day, every facility and every opportunity for increasing output must be utilized to the utmost.

You steel parts manufacturers are working wonders in production.

And we at Union Drawn will continue to do everything within our power to help you do the job.

The uniform machinability of Union Cold Drawn Steels—the outstanding feature of these steels for more than half a century—is being steadily maintained. The unvarying cutting qualities, the uniform structure, the freedom from tool-wearing abrasives and the smooth finish after machining are today equal to or better than those of last year or preceding years. Hence you can depend upon these steels to help you maintain consistently high production efficiency and quality of finished parts. Physical properties and heat treating qualities are being maintained at their high levels, too.

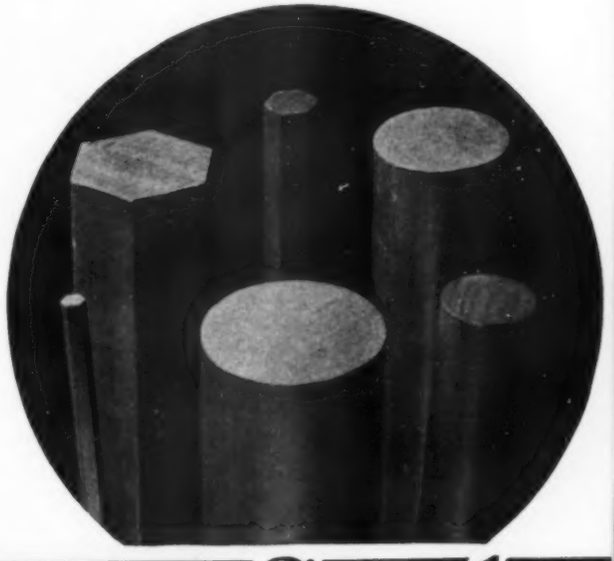
Are you taking full advantages of this uniform machinability in stepping up and holding an increased rate of production?

To help you establish the most efficient rate of output, and to provide you with a handy reference for comparing steels by their various designations and machinability, we present the table of surface-cutting speeds for various grades of cold drawn carbon steel shown on the opposite page.

While our most important job today would seem to be the production of every possible pound of the most machinable steel in needed analyses, we continue to feel an equal responsibility in assisting steel parts producers to obtain the highest rate of production of perfect parts from that steel at the lowest cost. If some particular problem concerning the use or performance of Union Cold Drawn Steel is bothering you, tell us about it. We want to help you find the answer—*quickly*.

UNION DRAWN STEEL DIVISION
REPUBLIC STEEL CORPORATION
MASSILLON • OHIO

Berger Manufacturing Division • Niles Steel Products Division
Steel and Tubes Division • Culvert Division • Truscon Steel Company
Export Department: Chrysler Building, New York, New York



Union Cold Drawn Steels

500% Increase IN Production

With Precision Boring Machine

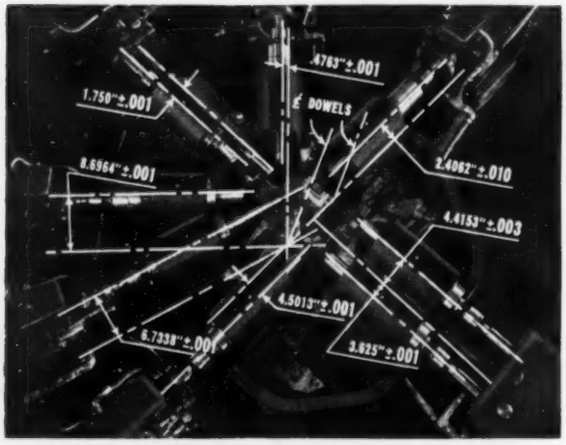
ONE OPERATOR BORES 9 HOLES

An unskilled man, after a few hours of instruction, can operate a Unit-Type Machine. The operator's work usually consists of loading, starting machine from a pushbutton control station, and unloading. Set-up time formerly required for single-spindle boring machines is converted to productive time with Unit-Type machine tools.

A prominent airplane engine manufacturer (name on request) reduced his machining time on the aluminum-alloy accessory housing illustrated at the right, from 30 minutes to 5 minutes per piece.

On this 7-way 9-spindle Unit-Type Machine, standard self-contained hydraulic units were used, which may be rearranged to accommodate future changes in the accessory housing.

The Model 75 Self-Contained Hydraulic Unit is designed for Drilling — Reaming — Boring — Face and Hollow Milling — Chamfering and Facing. Deliveries are delayed when ordering is delayed . . . Investigate today — the possibilities of increasing your production with Unit-Type machines. More information will be sent to you promptly—ask for 75 SH folder.



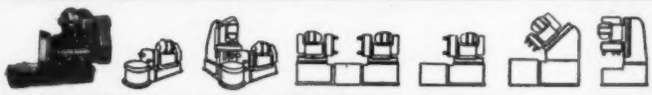
The tolerances specified on this job are shown above — yours may be tougher. Send us your part prints with specifications and our engineers will be pleased to make recommendations and aid you in obtaining your specified accuracies while increasing your production.

Diameters Held to ±.0005"-Location ±.001"
Angular Location ± 15 Seconds

These close limits of machining on the airplane engine accessory housing presented many difficulties to the manufacturer while using his previous method.

In the Precision Boring Machine the nine precision spindles work simultaneously eliminating the possibility of error resulting from individual settings and numerous gaugings.

The tool is guided in individual bushings. These are mounted close to the workpiece and are doweled and bolted securely in place. Each tool is provided with micrometer adjustment simplifying accurate diameter control.



Save 20 to 35% with Unit-Type Machine Tools

You save engineering and pattern costs on complete feed and drive units, because drawings and patterns are available. • Boring, Drilling, Reaming, Tapping and Milling Operations can be done simultaneously. • Unit-Type machines can be readily rearranged to accommodate future changes in your part design. Write for folder 75 SH on construction and application of 3 H. P. Unit.

TYPES OF MANUFACTURERS USING UNIT-TYPE MACHINE TOOLS

Automobiles—Airplanes	Pipe and Fittings
Air Conditioning	Tractors—Trucks
Gun and Armaments	Washing Machines
Pencil Sharpeners	Oil Drilling Equipment
R. R. Equipment	Hydraulic Equipment

FREE PRODUCTION AND TOOLING IDEAS

Eight bulletins, each describing and tracing a machining problem from the original study of the part to the final machine design will be sent to you upon request. These may prove to be of value to you today, or in the future. Ask for Bulletins on 3-Point Design.

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

Solves Unusual Problems by Usual Methods

Gives Faster, Smoother, Better Work in

FINISHING, DE-BURRING, POLISHING

WELDON ROBERTS

Brightboy

Already Proved In Many War Industries

The
Rubber-Cushioned
Abrasive

WHEELS, STICKS,
BLOCKS, TABLETS,
SPECIAL SHAPES

Removes Light Digs, Tool and Heat Marks: *Cleans* Welded and Soldered Joints; *Finishes* Dies; *De-burrs* Light Stampings and Machined Parts

1. NO TIME TAKING CHANGE IN WORK METHODS

Brightboy wheels, for use on lathes and portable and stationary power machines, and Brightboy tablets, sticks, rods and special shapes for hand work, are easily used in the conventional manner. *But from a "results" standpoint, there's no comparison!* Brightboy's abrasive, "cushioned" right into a resilient *rubber* binder, gives an unusual operating ease, producing an effect entirely different from a grind or a buff. Gives a faster, smoother, better job. Cuts down operations. The wheels de-burr, finish and put on a slight radius, in *one* operation!

2. NO SPECIAL TRAINING NECESSARY

Any worker can use Brightboy, without special instruction.

3. NO SPECIAL PREPARATION REQUIRED

Brightboy is ready for *immediate* use. In operation, the abrasive recedes into the resilient rubber, falling free as the soft rubber binder wears away.

4. NO WASTE

Every bit usable—even a worn-down Brightboy Wheel can be used for manual operations.

Available to war industries through leading distributors. Write us for catalogs and prices if your dealer cannot supply you. Our representative will be glad to call.

BRIGHTBOY INDUSTRIAL DIVISION • WELDON ROBERTS RUBBER CO. • Newark, N. J., U. S. A.

For Speeding Plant Conversion—
MOTCH & MERRYWEATHER COLD SAWING MACHINES

First, the change-over to war production. Then, a mounting determination to turn out more and *more* and *still more* materiel. In these procedures the cold sawing of metal holds an increasingly important place. Motch & Merryweather Cold Sawing Machines can greatly simplify your plant conversion and then lift your production rate because of five proven qualities:

Accuracy. The M & M Cold Saw delivers consistently square sections without chatter or burr, without variation, and without scrap.

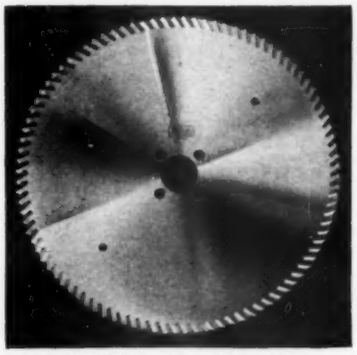
Speed. You get steady cutting speeds up to 1-1/2 times the highest rate ever attained before. "Amazing!" technicians declare.

Flexibility. Available is a range of attachments for the single or multiple cutting of practically any metal, ferrous or non-ferrous.

Capacity. Two sizes, the No. 3 and No. 4, handle round stock up to 16" and squares up to 14-1/2".

Stamina. You can run the M & M Cold Sawing Machine to capacity 168 hours a week and keep it up indefinitely. Ask for our bulletin.

Motch & Merryweather Cold Sawing Machines have speeded the cutting of billets for gun barrels, of shell slugs and other items of war production.



Motch & Merryweather Saw Blades fit any standard machine. They excel in design, fit, workmanship, cutting speed and endurance. Sizes, 26", 28", 30", 38", 42", 44".

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
Penton Building . . . Cleveland, Ohio

Built by **MOTCH & MERRYWEATHER**

MOTCH AND MERRYWEATHER THE MACHINERY CO
CLEVELAND CINCINNATI DETROIT PITTSBURGH

ACCELERATE TODAY'S WAR EFFORT

WITH BROWN & SHARPE PRECISION TOOLS

— — Designed and built
for *dependable service*
so important today
on round-the-clock
production

For Efficiency
Use Brown & Sharpe —

- Micrometers
- Rules
- Combination Squares
- Bevel Protractors
- Straight Edges
- Squares
- Vernier Tools
- Gages
- Dial Test Indicators
- Speed Indicators
- V Blocks
- Calipers and Dividers

We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.

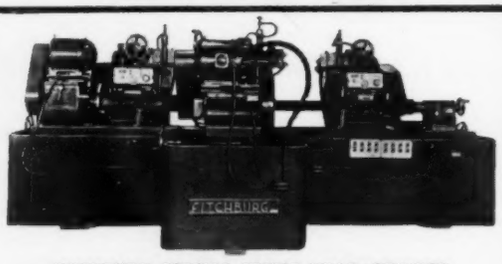
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.
BS

BROWN & SHARPE TOOLS

Save MONEY, MAN HOURS AND MATERIAL ON MASS PRODUCTION WORK

With FITCHBURG AUTOMATIC MULTIPLE PRECISION GRINDING

FITCHBURG TWO HEAD MACHINE



FITCHBURG SPECIAL TRIPLE HEAD GRINDER

FITCHBURG SPECIAL CHUCKING GRINDER

On precision grinding these machines give you savings in time and costs similar to those earned with multiple tooling and combined cutting. Fitchburg's method of mounting Standard Bowgage Head Grinding Wheel Units to multiple grind special jobs will cut grinding time and costs for you.

In speeding the production of heavy gun barrels, shafts, long spindles, etc., Fitchburg Bowgage equipment employed in this new multiple grinding machine enables the precision grinding of several dimensions at a single handling. Grinding is all done within the time required for the longest single operation.

This Fitchburg special Chucking Grinder with a heavy duty headstock, is designed to grind the ojive of armour piercing shells. The wheelhead is a Fitchburg Standard Bowgage Unit and offers special advantages on mass production in grinding jobs like this — savings that will rapidly repay cost of Fitchburg machines.

When installing special grinding equipment, it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.

This book shows how to cut grinding costs . . . write for it today . . . it's free to executives.

This bulletin furnished to authorized manufacturers free . . . write for it today.

Write for this bulletin giving complete details . . . it will be mailed free to executives.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

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Let us help you *speed* war production

ALTHOUGH our stocks of steel are not what we wish they were, what we have can be yours in a hurry—subject, of course, to priority restrictions. If we don't have what you need, we will do everything possible to help you find a source of supply. Our first job, like yours, is to do everything we can to speed production that will help win the war.

"Scully Service" is on the job—in all of our eight conveniently located warehouses—day and night. Be sure to try Scully—see our phone numbers at the left. Cut out the number of the warehouse nearest you and paste it in a handy spot.

IN STOCK! DARDELET "RIVET-BOLTS"

We can offer immediate shipment of both Dardelet "RIVET-BOLTS" and Dardelet Machine Bolts. These bolts save valuable time and labor and assure permanently tight joints.

The Dardelet "RIVET-BOLT" is a ribbed bolt with Dardelet self-locking thread, and is widely used for field erection of structural steel. Has recessed nut. Bolt is driven in and nut is applied with wrench. Economical and strong.

The Machine Bolt with Dardelet self-locking thread is for general use where vibration is present.

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SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel and Steel Products

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UNITED STATES STEEL

"Blount" MODEL F. WET TOOL GRINDER

New!.....for tool room or shop—assures stepped up production

The MODEL "F" is a distinctly new wet tool grinder with advanced features which adapt it to modern production in grinding all hard metal, special alloys and tungsten carbide. It is built for long, hard service and can be depended on to speed up grinding operations. It is built in 14", 20" and 30" sizes.

Outstanding features include:

. . . motor mounted in air-flow base for cool running. It is easily accessible for take-up of multi-v belt.

. . . quick and easy wheel change made possible by merely removing cover on wheel side unscrewing a single nut and removing flange.

. . . oversize spindle shaft turns on Timken tapered roller bearings mounted in specially designed pillow block, easily adjusted.

. . . constant flow oiling of positively sealed spindle bearings.

. . . wheel and shaft adjustable for balance.

. . . all belts are completely adjustable.

. . . wheel dressing simplified by means of a new combination tool rest and wheel dresser permanently located in front of wheel.

. . . convenient remote control provided for coolant.

Send for CIRCULAR A-7 which contains complete details and specifications.

J. G. BLOUNT CO., Everett MASS., U.S.A.

TARGET FOR TONIGHT

...*Your Business?*

Maybe they won't actually come and drop a *bomb* on your business, but the Axis war lords have their eye on it, just the same. They want to wipe it out as a competitive force—or take it over lock, stock, and barrel. Here is a threat that you can reply to *now*, today, and in no uncertain terms—by buying Defense Bonds to the very limit of your powers, that our armed forces may have the guns, tanks, and planes they need to crush the Axis *once and for all.*

HELP YOUR EMPLOYEES TO DO THEIR PART, TOO

Every American wants the chance to help win this war. When you install the Pay-Roll Savings Plan (approved by organized labor), you give your employees that chance. For details of the Plan, which provides for the systematic purchase of Defense Bonds by voluntary pay-roll allotments, write: Treasury Department, Section S, 709 12th St. NW., Washington, D. C.

***Make Every Pay Day* "BOND DAY"**

***Save with* U. S. *Defense* BONDS ★ STAMPS**

This space is a contribution to Victory by

AMERICAN MACHINIST

WANTED!
THE RETURN OF
HIGH-SPEED STEEL SCRAP
Believed in hiding in America's vital industrial plants. Description—aged, worn or broken down. To be returned and drafted "in the service." This notice addressed to all users and makers of high-speed steel tools interested in apprehending this slacker.
REWARD
The satisfaction of knowing you are doing your bit to relieve high-speed steel shortage

YOUR TOOL STEEL MAKER *needs your* HIGH SPEED STEEL SCRAP

★

5

- The growing scarcity of steel scrap must not be allowed to hamper America's war effort. The necessity for its prompt salvage is therefore self-evident! Especially is this true of high speed steel, since its high Vanadium content is of such vital importance.

Latrobe is using this space to urge all tool steel users and manufacturers of tools to make every effort to return to your tool steel producer all such scrap. You will help yourself as well as our country by your prompt cooperation.

LATROBE

ELECTRIC STEEL COMPANY

LESCO

MAIN OFFICES *and* PLANT • LATROBE · PA·

ARE YOU A CONVERT?

Nearly everybody is, these days, with America switching from peacetime to wartime effort. New products—new machines—new tools—and everybody running at top speed to make conversions.

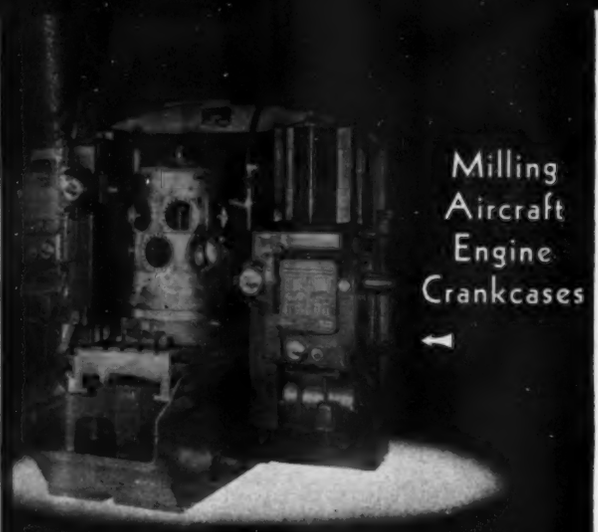
If you are making up new dies or tools or production parts which require resistance to abrasion or wear, we invite you to try Graphitic Steel. It will machine 25% faster than any other tool steel you ever used—and it will wear longer.

Graphitic Steel . . . will speed your war production for VICTORY and help you to profitably buck post-war competition.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS



Milling Aircraft Engine Crankcases

Milling Airplane Engine Master Rods

Turning Airplane Pistons

SUNDSTRAND Machine Tools *for Urgent War Work!*

Sundstrand Automatic Lathes and Rigidmils are doing urgent work for all the armed forces, and for many critical sources of supply. For the *Air Arm;* they machine engine parts in enormous quantities, engine accessories, blades and other propeller parts, landing gear components, instrument parts and armament. For the *Land Forces;* parts for motors, transmissions, and other units that go into tanks, trucks, tractors, and transport vehicles. For the *Navy;* a variety of work-pieces ranging from steam turbine blades to parts for mosquito boat engines, submarine diesels, and torpedoes. For the *Fire Power* of all branches, they are used widely in the mass production of rifles, pistols, revolvers, light and heavy machine guns, rapid fire cannon; also shot and shell, bombs and other ammunition.

On additional war work, Sundstrand Engineered Production Service develops most effective applications of Sundstrand standard equipment — meets a host of unusual requirements by creating semi-standard machines that give remarkably satisfactory results in speed, production, adaptability and economy — have designed wholly special machines when necessary. This cooperative service saves time for hard-pressed executives and engineers, quickly gives them reliable proposals on production milling, turning and related operations. It is available, without obligation, to all manufacturers in accordance with official urgency ratings. Sending complete accurate data, correct drawings, and all necessary additional information with each specific inquiry will save time all around and help our common cause · · · — Victory.

Get These Bulletins — Additional information about uses of Sundstrand Machine Tools on war work is contained in two timely publications. One illustrates machining of airplane engine and propeller parts. The other shows shell-turning, complete with diagrams and data. Write for both. Just ask for Bulletins 102.

Turning Airplane Propeller Domes

Turning Gun Barrels

lling Steam Turbine Blades

Airplane Engines . . .
Crankcases, Pistons, Master Rods, Articulated Rods, Magneto parts, Piston Rings, Cylinder Sleeves, Super-charger parts.

Airplane Propellers . . .
Blades, Barrels, Domes, Dome Retaining Nuts, Hub Spiders, Cams.

Steam Turbines . . .
Various milling operations on turbine blades of many types.

Projectiles . . .
Turning operations on shell and shot, ranging from 20 m.m. to 105 m.m. Parts for torpedoes and bombs.

Tanks . . .
A large variety of parts for engines and transmissions.

Small Arms . . .
Milling and turning operations on rifles, pistols, and machine guns of all sizes and types.

SUNDSTRAND MACHINE TOOL CO.

2533 ELEVENTH STREET, ROCKFORD, ILLINOIS, U. S. A.

These 2 Words MAKE MOTOR-DRIVE *MORE THAN* POWER!

- *Motor-drive provides within itself a means of:*

Speed Control
Braking
Tandem Operation
Tension Control
Reversing
Remote Control
Controlled Acceleration
Safety
Slow Speeds for inching, threading, inspection

Applying them to boost production and improve quality is APPLICATION ENGINEERING. That's our business.

In process just behind these windows are armature coils, field coils, stator coils, all in great variety—evidence that the Reliance Motors of which they will be a part are designed to perform many functions besides turning shafts and gears. Motors will fit the job. They are going to users who started their machine design and production plans with the question, *"What can we get the motor to do besides supply power?"* Help in answering this question can be given by Reliance men trained to think of motor-drive in terms of production. There's no obligation involved in asking us to sit in with you and talk it over.

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1088 IVANHOE ROAD • • • CLEVELAND, OHIO

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RELIANCE A-C D-C MOTORS

CEMENTED CARBIDE BLANKS

Standard or made-to-order

METHOD 4

Vascoloy RAMET

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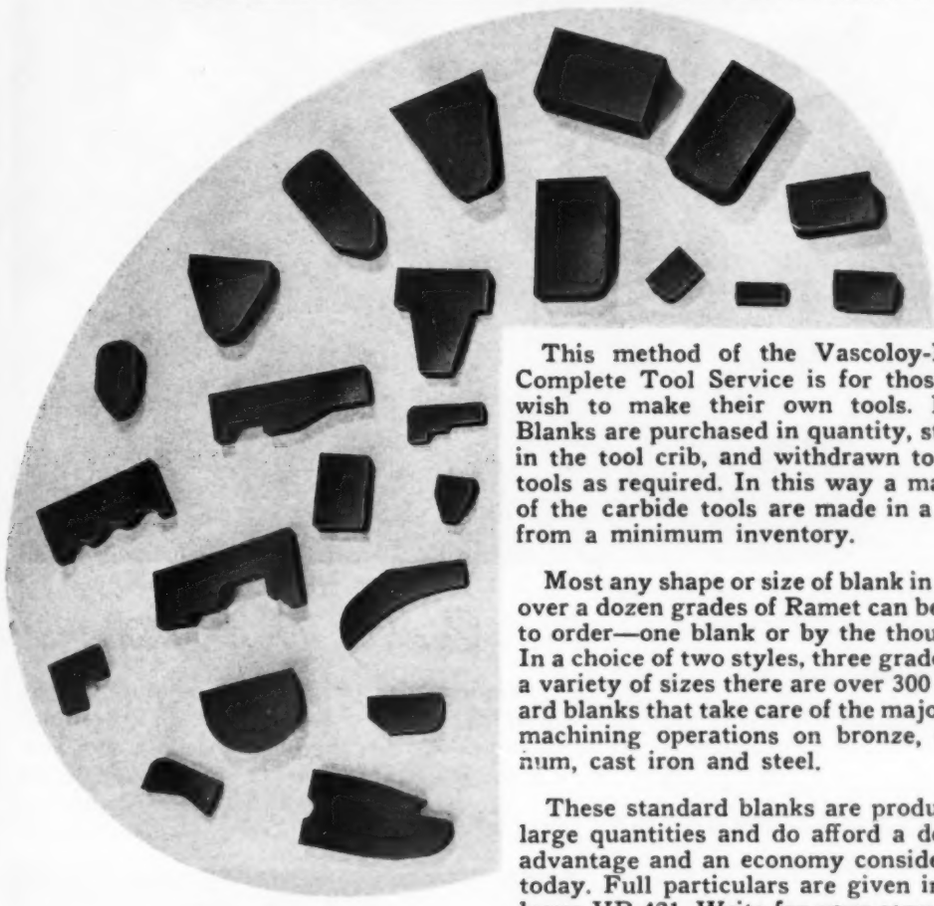
5-METHOD COMPLETE TOOL SERVICE for MAXIMUM PRODUCTION



Typical Ramet Carbide Tool Blanks

This method of the Vascoloy-Ramet Complete Tool Service is for those who wish to make their own tools. Ramet Blanks are purchased in quantity, stocked in the tool crib, and withdrawn to make tools as required. In this way a majority of the carbide tools are made in a hurry from a minimum inventory.

Most any shape or size of blank in any of over a dozen grades of Ramet can be made to order—one blank or by the thousands. In a choice of two styles, three grades, and a variety of sizes there are over 300 standard blanks that take care of the majority of machining operations on bronze, aluminum, cast iron and steel.

These standard blanks are produced in large quantities and do afford a delivery advantage and an economy consideration today. Full particulars are given in catalogue VR-421. Write for your copy.

Prompt Delivery on Standard Ramet Blanks

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES

IN CANADA: **Carbide Tool & Die Company, Ltd., Hamilton, Ont.**

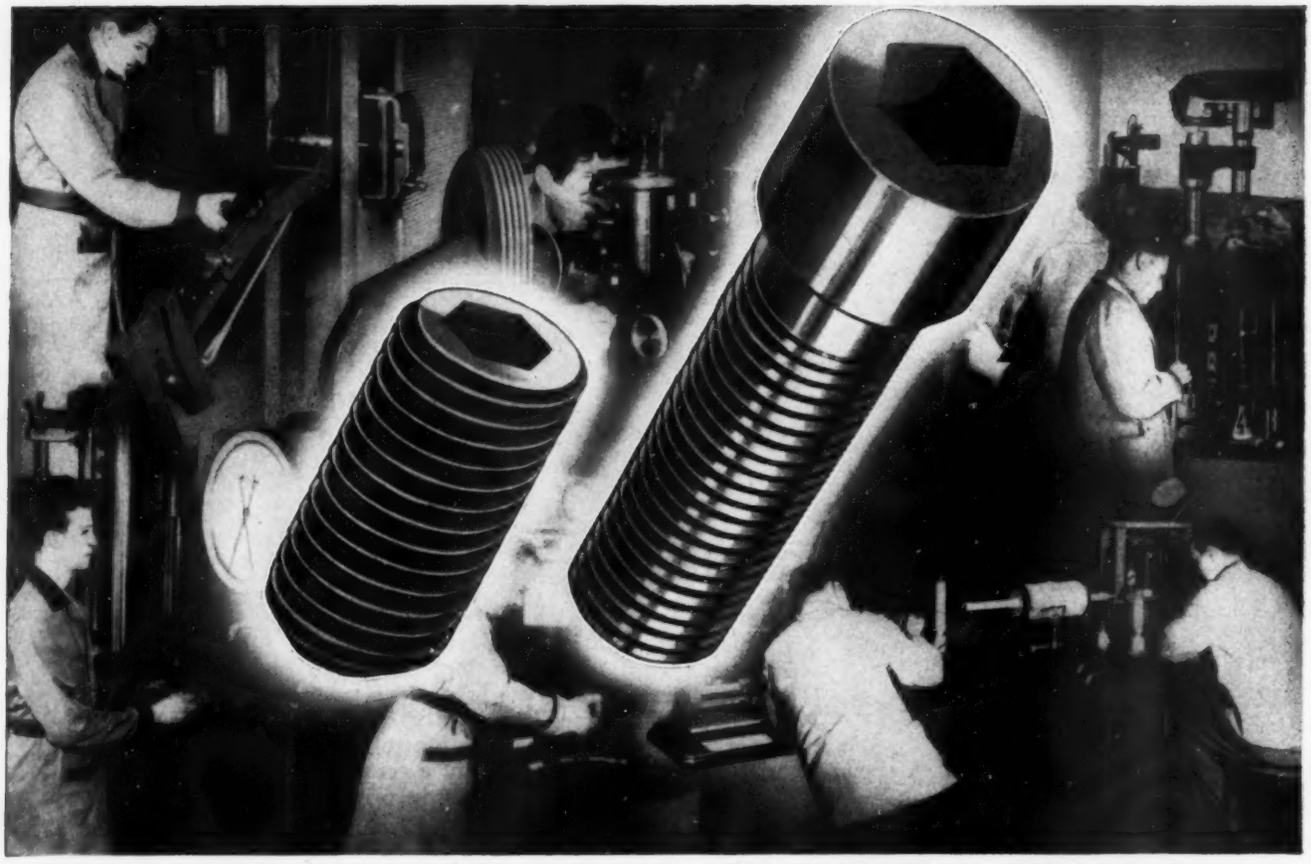
4232

TANTALUM-TUNGSTEN CARBIDE

FOR TOOL SERVICE..... *Specify* Vascoloy RAMET **TOOLS**

TANTUNG "G"

Right in EVERY DETAIL—
to make every working hour count!



Every Parker-Kalon Socket Screw is quality-controlled by a unique routine!

Physical and dimensional characteristics of Parker-Kalon Socket Screws are maintained well beyond generally accepted standards. Parker-Kalon's Quality-Control Laboratory – without counterpart in the screw-making industry – stands guard over every detail. "Doubtful screws" – screws that *look* all right but some of which fail to *work* right – are eliminated by a rigid, step-by-step check routine that begins with a careful analysis of the special alloy steel. This extra dependability is paying dividends to countless users who must today make every working-hour, every man-hour count. Yet, it costs no more to specify PARKER-KALON! Parker-Kalon Corporation, 194-196 Varick Street, New York, N. Y.

Quality-Controlled

Complete test and inspection routine covers: Chemical Analysis; Tensile and Torsional Strength; Ductility; Shock Resistance under Tension and Shear; Hardness; Head diameter, height and concentricity; Socket shape, size, depth and centricality; Thread fit. Every detail is checked!

PARKER-KALON
Quality-Controlled
SOCKET SCREWS

Give the Green Light to War Assemblies

Precision LIMIT SWITCHES

and

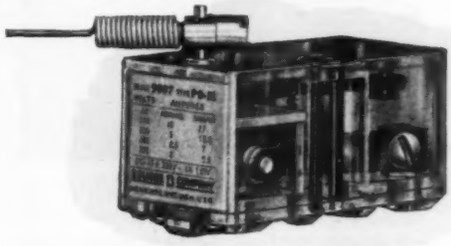
RUGGED, HEAVY DUTY TYPE M AND THE SMALLER TYPE P

An Ideal Team for Machine Tool Service

A Year Ago—Square D announced the Class 9007 Type M Limit Switch, specifically designed for machine tool applications. Oil-proof enclosure, various mounting arrangements, large S.P.D.T. silver contacts, generous over-travel, and exceptionally long life—*all* were features of that design. A year's performance in war-paced plants throughout the country has proved their value.

Now—Square D makes available to you, the Type P Limit Switch—much smaller in size but with features identical with Type M. It can be used for those applications where mounting space and operating force or travel are limited.

From Now On—solve troublesome limit switch problems by specifying Square D. You'll profit by the same thorough engineering, long life and low maintenance cost which have made Square D starters, machine tool control panels and push buttons the accepted standard in thousands of plants.



TYPE PO-11A basic precision limit switch unit can be mounted as an integral part of compact drilling or tapping machine heads or similar mechanisms.

- Transparent moulded polystyrene case (no carbon tracking) allows visual inspection of contacts.
- Electrical ratings high enough for *direct* control of contactors and small solenoids.
- Shutter-type toggle mechanism gives extremely accurate operation with only 2½ ozs. operating pressure at 1" lever arm.
- Available with flush or surface mounting enclosures —roller arm or push rod operated.

CALL IN A SQUARE D MAN

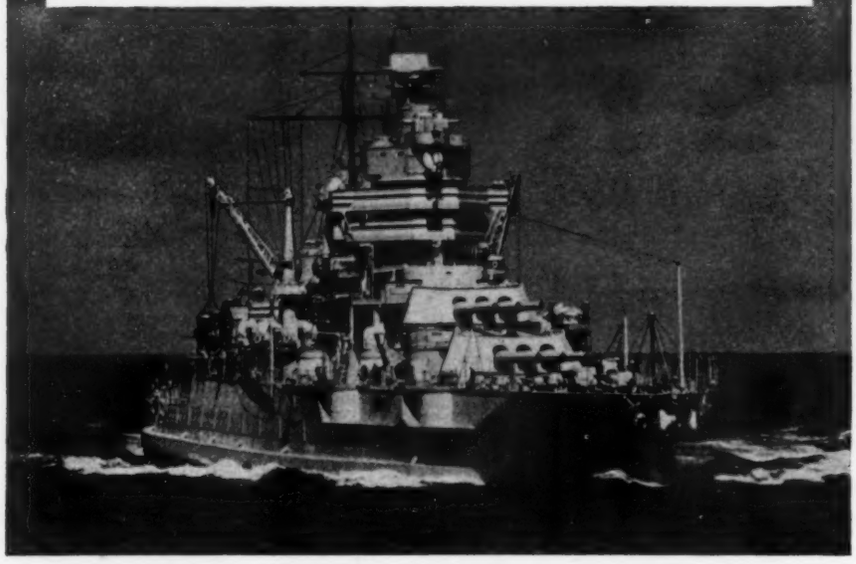
SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

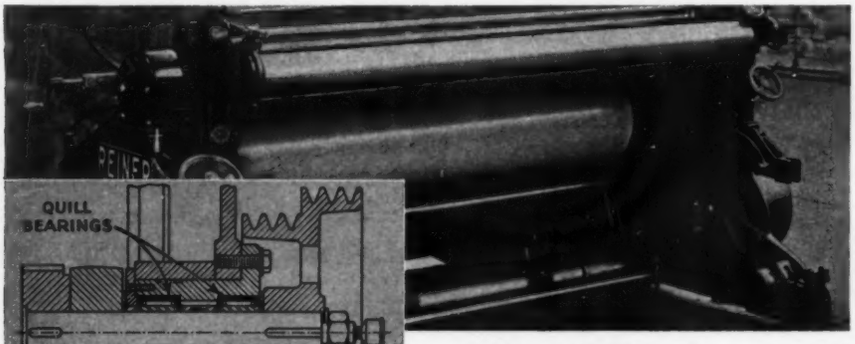
KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

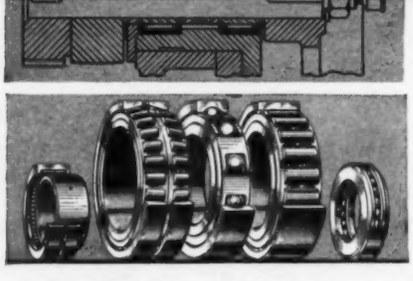
IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

IN THE NEWS
WITH BANTAM BEARINGS



HUNDREDS OF ANTI-FRICTION BEARINGS—from tiny, jewel-like parts for delicate instruments to bearings of huge dimensions which support revolving gun turrets weighing many tons—are needed to complete a modern ship of our growing battle fleet. Speeding production of the country's wartime shipping program is Bantam's delivery of many of these bearings *months ahead of schedule*. For Bantam is tooled-up to meet the new and unusual in bearing design. Whether you need a special bearing or one of many standard types, TURN TO BANTAM.

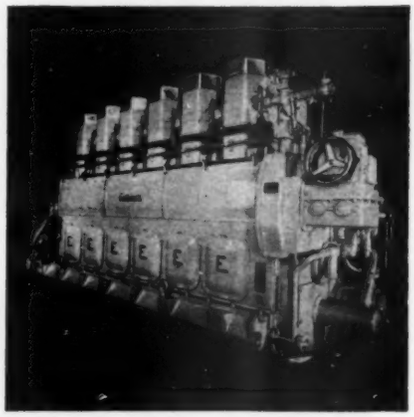




PROMPT DELIVERY OF SPECIAL BEARINGS is part of Bantam's contribution to America's war effort. Tooled-up to handle new and unusual requirements with a minimum of delay, Bantam can often make delivery of special bearings in less time than standard units can be obtained under today's conditions. In addition, Bantam makes many standard sizes of anti-friction bearings—straight roller, tapered roller, needle, and ball. For fast deliveries and skilled counsel on the selection of *your* bearings, TURN TO BANTAM.

IN TEXTILE MACHINERY, efficient, economical operation is assured through the use of Bantam Bearings. In this high-speed warping machine, built by Robert Reiner, Inc., Bantam's Quill Bearings are employed on the drive shaft—a typical application of this high capacity anti-friction unit. Note also the simplified design permitted by its use as illustrated in the cross-sectional drawing. Other features of the Quill Bearing include ease of installation, efficient lubrication, low unit cost.

TO SUBSTANTIALLY REDUCE POWER REQUIREMENTS AND INCREASE SPEED OF OPERATION, Bantam Quill Bearings are used on the bridge truck wheels of this electric hoist crane. Made by Northern Engineering Works, these hoists are built in sizes capable of handling up to 15-ton loads. The small size, high capacity, and efficient lubrication of the Quill Bearings contribute to their compact design, efficiency and long service life.



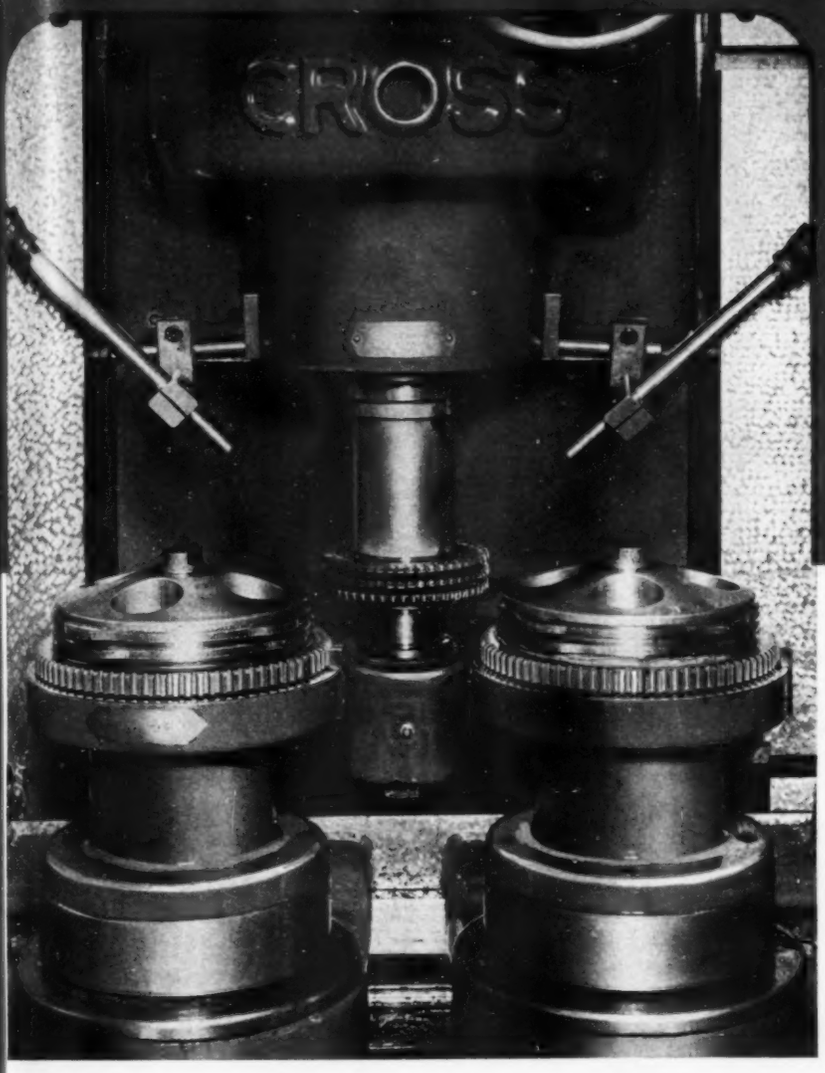
GIANT DIESELS—16" x 20" bore and stroke marine engines—supply the motive power for our growing wartime merchant marine—and constant, reliable service is a must. In the tappet roller assemblies of these huge giants of power, built by Enterprise Engine & Foundry Co., hundreds of precision Bantam needle rollers serve to reduce friction and wear—another example of Bantam's service in supplying bearings for specialized applications.

BANTAM BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

BANTAM BEARINGS CORPORATION • SOUTH BEND • INDIANA

RAPID DUPLICATION OF PRECISION AIRCRAFT ENGINE PARTS



Massive and rugged unit construction is compactly arranged for rigidity and optimo performance. The MilLathe is engineered to produce more work of superior quality and occupy only a small floor area.

THE CROSS *MilLathe*

The unique features of the Cross MilLathe are assisting a mid-western plant to rapidly mill timing cams to the fine finish and precise limits which characterize the Pratt & Whitney Radial Engine. Seven surfaces are accurately machined to a smooth finish quickly and with unskilled labor. Three narrow cutters feed between two revolving work pieces to finish both parts simultaneously.

Most cylindrical, conical or flanged work, and especially parts with interrupted cuts or complicated contours, can be machined faster with the MilLathe. Easy to adapt to a variety of work because of its flexibility, the Cross MilLathe is also your best assurance of exact duplication to precision tolerances because the accuracy is "built into" the cutters.

Carbide tipped cutters, with the power, speed and feed range of the MilLathe, form an ideal combination for milling fins in cylinders and cylinder heads.

CROSS GEAR & MACHINE CO.

Established in 1898

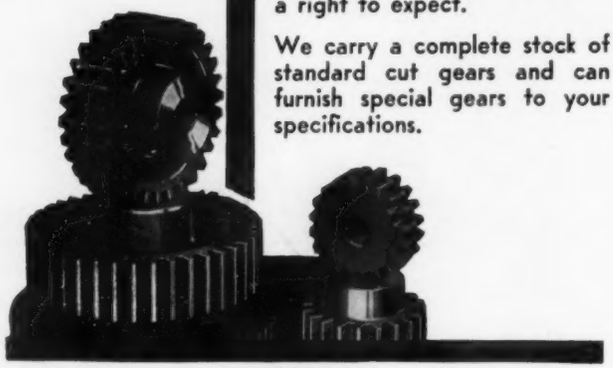
DETROIT, MICHIGAN, U.S.A.

GRANT GEARS

"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.



GRANT GEAR WORKS
BOSTON, MASS.

ESTABLISHED 1877 — GEAR — BY ED. B. GRANT

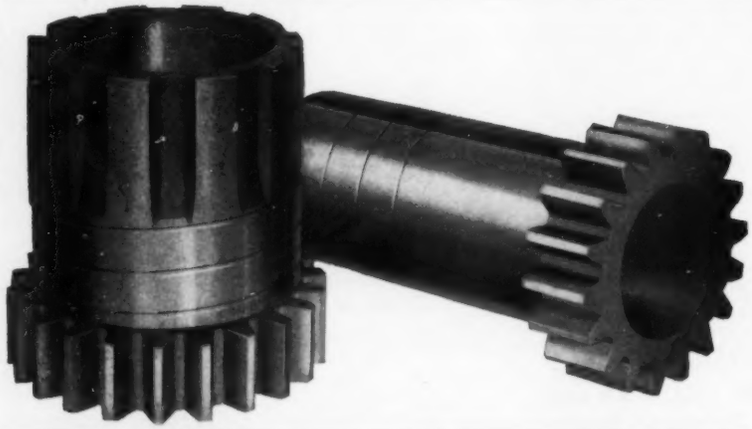
Westinghouse offers the solution to geared drive problems . . .

If you are faced with a drive problem, look to Westinghouse for the answer.

Westinghouse has the "know-how" that comes from over 50 years' experience in building every kind of geared drive . . . from gearmotors to giant propulsion gears for battleships. Ask your Westinghouse representative for recommendations.

J-07200

Westinghouse
GEARED DRIVES

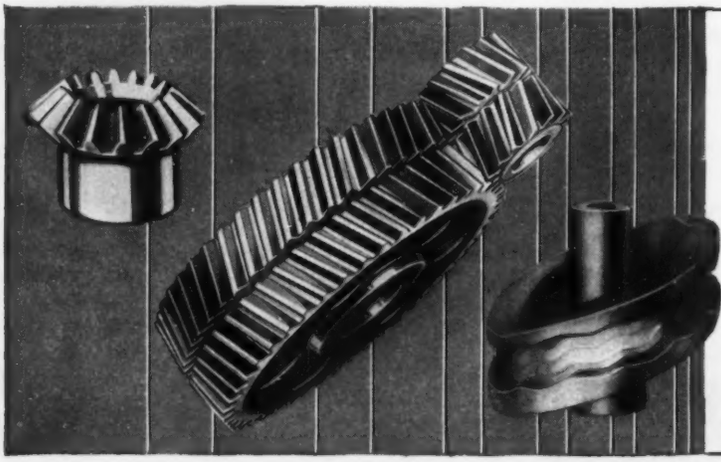


ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa



GET YOUR QUOTATION *from* "HARTFORD"

GEARS of every description cut to order

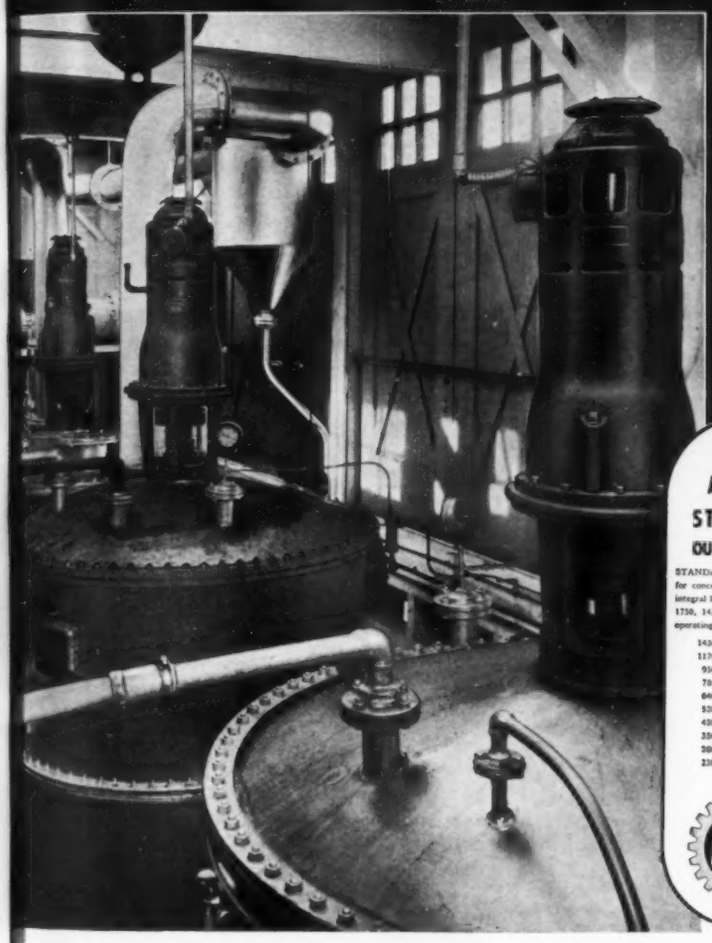
GEAR, CAM and THREAD grinding

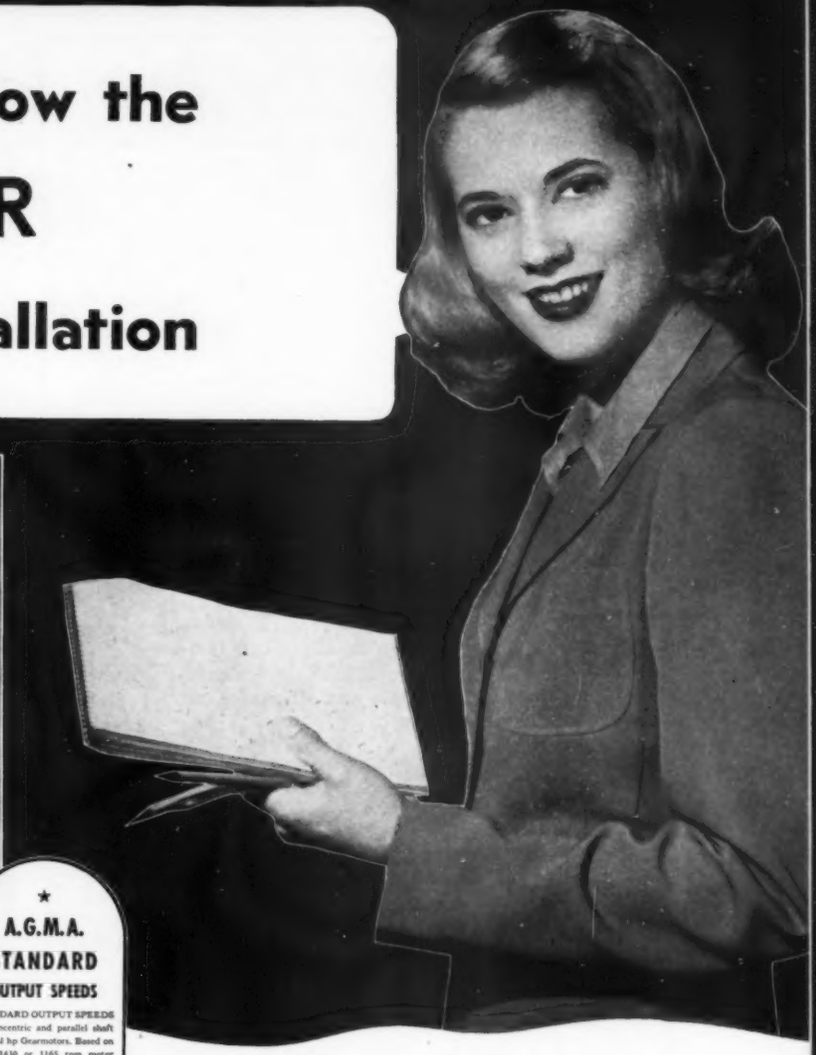
AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

Shall I tell them how the MOTOREDUCER simplifies the installation





★
A.G.M.A. STANDARD OUTPUT SPEEDS

STANDARD OUTPUT SPEEDS for concentric and parallel shaft integral hp Gearmotors. Based on 1750, 1430 or 1165 rpm motor operating speeds.

1430	190	25
1170	155	20
950	125	16.5
780	100	13.5
640	84	11.0
520	68	9.0
430	56	7.5
350	45	6.0
280	37	5.0
230	30	4.0

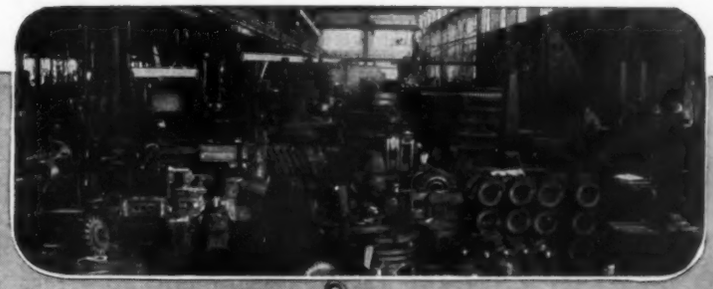
AGMA

The MotoReduceR, in both the horizontal and vertical types, has been designed as a complete straight-line unit with motor and reduction gears in a single, compact housing. The extra coupling, base-plate and all other unnecessary parts have been eliminated. This unitized construction saves considerable time and effort in installing and enables it to fit in places where other types of drives would be impractical. This design, however, in no way interferes with the accessibility of the various parts. Get our catalog that explains the many other advantages of the Philadelphia MotoReduceR. It's yours for the asking.

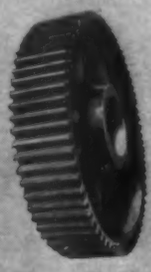
PHILADELPHIA GEAR WORKS

INDUSTRIAL GEARS AND SPEED REDUCERS
LIMITORQUE VALVE CONTROLS

ERIE AVENUE & G STREET
PHILADELPHIA, PA.
New York, Pittsburgh, Chicago



Philadelphia **LIMITORQUE CONTROL** operates all types of valves, etc., safely, economically, from convenient stations.



Philadelphia **GEARS** All types and sizes of industrial gears. Can be supplied in all materials.

Philadelphia **WORM GEAR SPEED REDUCER** right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

Philadelphia **MOTOREDUCER** The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

Philadelphia **HERRINGBONE SPEED REDUCER** for heavy loads at high speed. Single, Double, Triple Reductions, various ratios and horsepowers.

CHOOSE "GEARS" WISELY

All industry has realized the importance of choosing gears wisely. That's why "The Right Gear for the Job" is so important.

Cincinnati Gears are custom-made to fit your particular problem. In selecting Cincinnati Gears for your production you are assured of precision and efficient assembly.

What's Your Problem?

Our gear counsel is used widely by many manufacturers. It may prove helpful to you.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
1825 Reading Road • Cincinnati, Ohio

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

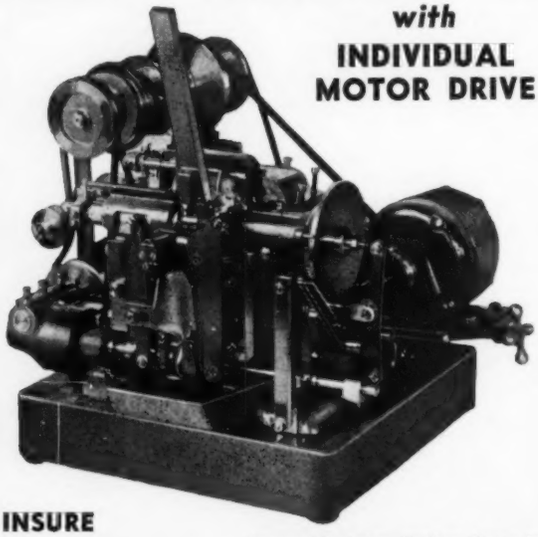
This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

Gear Specialties
MANUFACTURERS
CHICAGO

2600 W. Medill Av. Ph. Hum. 3482

WALTHAM MAGAZINE Fed PINION CUTTERS with INDIVIDUAL MOTOR DRIVE



INSURE
Great Accuracy
Smoothness and
Production. . . .

Improved in design, Waltham Pinion Cutters achieve not only great accuracy and smoothness of work but also steps up production.

The magazine feed may be omitted and fine pitch gears up to 1½" diameter may be cut in a stack about 1" long.

A countershaft for group drive can be supplied if preferred. Bench space requires 20"x22". Write for further details.

WALTHAM MACHINE WORKS
HIGH STREET WALTHAM, MASS.

---a "DEGREE" in gear perfection

An interesting brochure, entitled "Gear Craftsmanship," will be mailed FREE upon request.

"Gears by Meisel" . . . These two letters signify thirty-three years of specialization in the art of gear design. They symbolize the *construction of gears for specific purposes* which, by their inherent accuracy, assure the highest possible degree of mechanical perfection. Lay your problem before a MEISEL Gearist to determine the *one* gear suited for your job.

MEISEL PRESS MFG. CO.
946 Dorchester Ave., Boston, Mass.

GANSCHOW GEARS

FOR SIXTY YEARS
Spur – SPEED REDUCERS – Worm
ALL TYPES OF CUT GEARS
GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

BRAWNY GEARS

PROMPT
ECONOMICAL SERVICE
ALL TYPES, MATERIALS
AND QUANTITIES
Ask for Estimate

BRAUN GEAR CO., 1590-1608 Atlantic Av., Brooklyn, N. Y.

THE JOHNSON FRICTION CLUTCH

Single

THE NEW "MAXITORQ" MULTIPLE DISC DESIGN.

. . for maximum serviceability in minimum space

The adaptability of JOHNSON FRICTION CLUTCHES to hundreds of different kinds of machines has been possible by the compactness of these sensitive durable units.

Many leading manufacturers of industrial machinery have standardized on JOHNSON CLUTCHES because their adoption involved minimum changes in design, and assured a maximum in clutch performance.

In addition to compactness, JOHNSON CLUTCHES offer quick, smooth starting. They are available for high speed can be depended on for safety, durability and economy.

Let us show you how easy it is to engineer the JOHNSON CLUTCH into your machines. Just send us details of how you propose to apply the clutch. Ask for our assistance today.

Write for Multi-Disc Clutch Catalog No. 74 or consult Sweet's or Thomas' Register

Double

Has Floating Plates in Neutral

THE CARLYLE JOHNSON MACHINE CO.

PERKINS produces every type of PRECISION, CUSTOM-CUT GEAR

Investigate Perkins facilities for producing the gears you need. You'll find that your most exacting requirements can be met, exactly to your specifications—from any material —in any quantity.

Our facilities for producing precision, custom-cut gears include modern gear generating machinery; our heat-treating and inspection equipment enable us to produce to the desired degrees of hardness and closest limits of accuracy.

All requirements of war production can be met by Perkins whether it's gears for precision instruments, aircraft motors or any other equipment.

PERKINS MAKES

HELICAL GEARS	BEVEL GEARS
SPIRAL GEARS	RATCHETS
WORM GEARS	GROUND THREAD WORMS
SPUR GEARS	

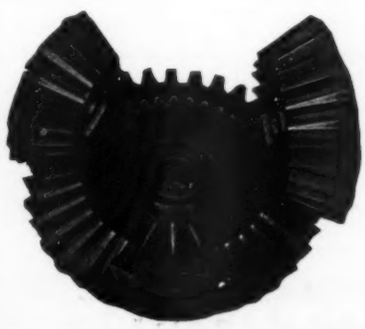
SEND US YOUR SPECIFICATIONS; ASK FOR QUOTATION

PERKINS MACHINE & GEAR CO.
Springfield, Massachusetts

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY



BEVEL GEAR RATIO

can be changed by merely changing the pinion.

BILGRAM

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

McKAY ELECTRODES . . . WHERE ENDURANCE IS VITAL!

In no other application is perfect integration of welded joints more vital than in the production of war implements . . . where the terrific strains, shocks and impacts of service demand absolutely *flawless* welds.

For such exacting requirements . . . welding stainless and other alloy steels . . . the McKAY line of Welding Electrodes includes *analyses* and *characteristics* to assure desired weld-perfection.

The superiority of the McKAY "researched" line, and the development and extension of it to meet these war production problems now, will be reflected in new, greater applications and economies in peacetime production later. Until then, McKAY Electrodes must continue to SERVE and SAVE for Victory only.

THE McKAY COMPANY · PITTSBURGH, PA.

PACIFIC COAST SALES OFFICES: 125 S. Santa Fe Ave., Los Angeles · 100 Howard St., San Francisco

The McKay line includes regular carbon steel, stainless, and alloy steel electrodes for every welding purpose. Literature on request.

The McKay Company was among the first honored with the coveted Navy "E" award for excellence in fulfilling Naval Ordnance contracts.

McKAY WELDING ELECTRODES

AND INDUSTRIAL, MARINE AND AUTOMOTIVE CHAINS

TODAY'S *No. 1 Problem* IN WAR PRODUCTION

● During the first days in school, our little boys and girls are earnestly *fitting* pegs and blocks into the holes *where they belong*. It's one of their earliest problems in school life.

Today, in Washington, the nation's key production men are engaged in a grim and all-important version of this same basic problem. Theirs is the gigantic task of *fitting the complicated pegs* of America's industrial and material resources into the largest war production program the world has ever known.

Into this complex problem, The Sisalkraft Co. *has found the places where its products fit.*

For over twenty years The Sisalkraft Co. has led in the development and production of reenforced, waterproof papers. *For over twenty years*, FIBREEN has been wrapping and protecting goods and materials, in transit and in storage.

Today FIBREEN continues to protect huge quantities of war materials of all kinds — *guarding them against damage* from rain, dust, sea water or salt air during long exposure to all kinds of weather—*keeping them in condition for use and action at destination.*

FIBREEN fits—because it's durable, completely waterproof, amazingly strong. It's used as a wrap, as a cover, or as a bag — in almost any size or shape — for planes, tanks and trucks or small arms, medical supplies, delicate instruments and vital repair parts.

It further fits the war program because it is produced many times faster than woven fabrics, with only a small portion of the labor, and at far less cost. In addition, it releases such vital materials as burlap and canvas for other important war needs—*and costs much less.*

Other Sisalkraft papers are also doing their part. They are being used to cure concrete floors in arms plants — or runways of flying fields — and to help build strategic military and access roads—*providing a better cure, with fewer man-hours, and at lower cost.*

And farmers are using Sisalkraft papers to help solve their major problem of storing grains and feeds — and to provide the silos they need so badly.

That's how the entire production of The Sisalkraft Co. today is confined to essential war uses.

If your product fits the war program — if you are concerned about the delivery of your products *in the same excellent usable condition* as they leave your factory—write us and see if FIBREEN is the answer to your problem. *Tell us what you make and how you now pack it.*

THE SISALKRAFT CO.

Manufacturers of Sisalkraft, Fibreen, Sisal-X, Sisaltape and Copper-Armored Sisalkraft

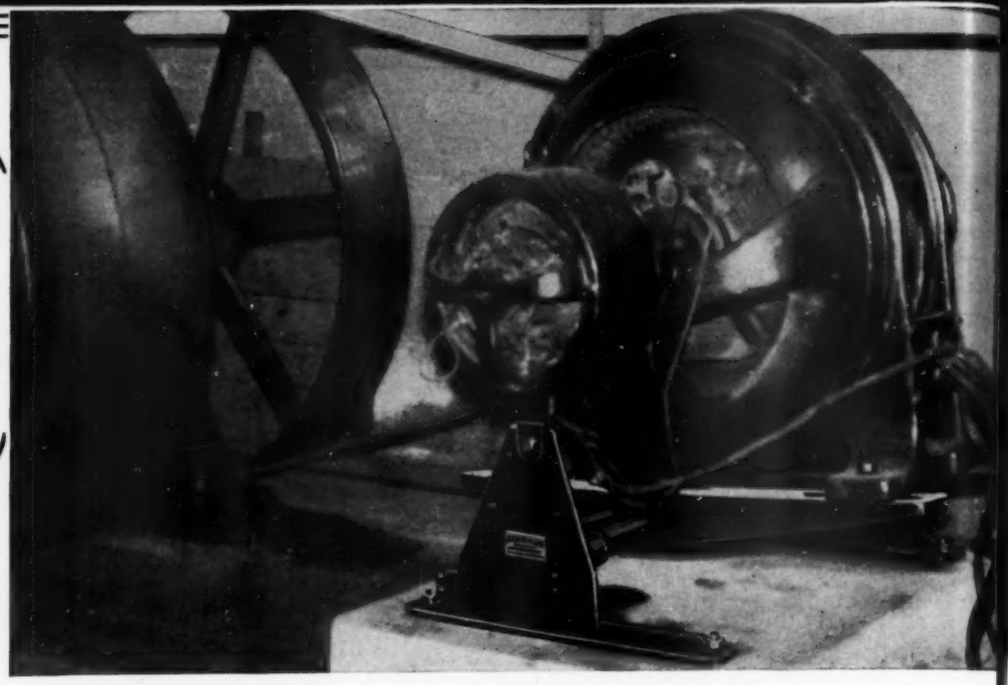
205 W. WACKER DRIVE • CHICAGO, ILL.
New York San Francisco London Sydney

In Canada Write to Alexander Murray & Co., Limited at Montreal, Toronto, Halifax, Saint John, Winnipeg, Vancouver

FIBREEN
EFFECTIVE *Protection* IN TRANSIT—IN STORAGE—FOR EMERGENCY USES

SERVING INDUSTRY, CONSTRUCTION AND AGRICULTURE THROUGHOUT THE WORLD

Belt Life is DOUBLED *with* AMERICAN



*Econ-O-Matic Drives are short-center drives, either flat-belt or V-belt, with American Motor Bases for *automatic* tension control . . . thus belts can't slip, and average belt tension is reduced. Belt life is at least doubled, as proved in many Econ-O-Matic installations.

American Econ-O-Matic* Flat-Belt Drive

Lengthens Belt Life in Texas Ice Plant

"One of the most effective drives I've ever seen," says Mr. D. G. Massey, Chief Engineer, about the **Econ-O-Matic Flat-Belt Drive** shown above operating a 60 KW generator at the Pacific Ice & Cold Storage Company, Dallas, Texas.

This **Econ-O-Matic Drive** is certainly a *belt-saver*... Before it was installed, belt slippage on the previous long-center (18' 0") drive was about 5%. Belt repairs were frequent. *A new belt was needed every two years.* Power and maintenance costs were unnecessarily high.

Now, with **Econ-O-Matic** efficiency on the job, belt slip has disappeared. Belt repairs have been nil! The present shorter flat-belt (7' 6" center distance) has been in service more than a year and is expected to give *many more years of trouble-free performance.*

Also, Mr. Massey reports power savings, lower maintenance cost and a valuable addition in floor space with this short-center **Econ-O-Matic Drive.**

HINT: Belts are getting scarce these days. *Conserve* the belts you have as well as those you expect to buy! Equip your power-driven machinery with **Econ-O-Matic Drives** . . . You'll *double* belt life! Our engineers will gladly prove this statement. Write us *today!*

What You Can Expect from American Econ-O-Matic Drives

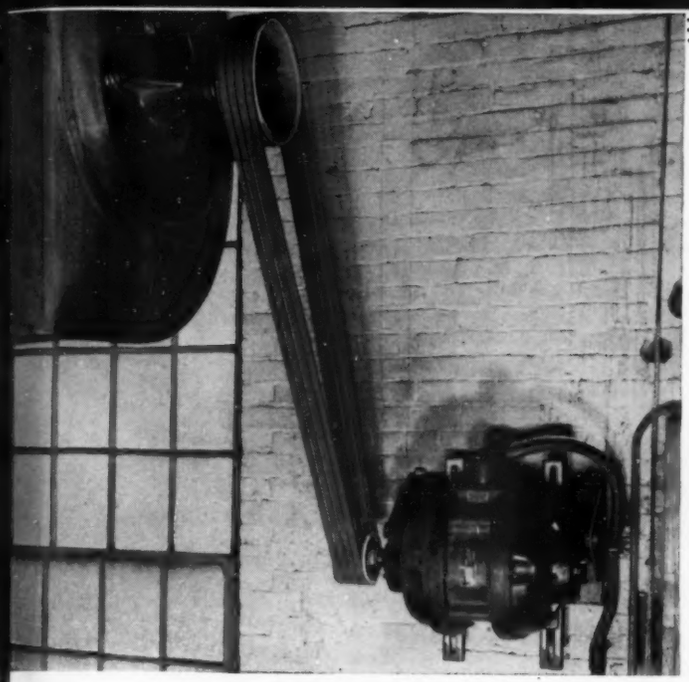
- ★ Belt life increased 100% or more.
- ★ Increased production because correct RPM level is sustained . . . no belt slip.
- ★ Bearing pressure reduced by 50%. Bearings last longer.
- ★ Power savings soon pay the entire low cost of an Econ-O-Matic Drive.
- ★ Man-hours and materials required for maintenance reduced an average of 75%.

Let our engineers prove these economies to you!

The American

4275 WISSAHICKON AVENUE

Econ-O-Matic* DRIVES



AMERICAN Drive Selection Service

BELTS MUST LAST!

Belting is becoming increasingly difficult to obtain. Belts *must* be made to last longer . . . and here's how to do it:

1. Select the right belt or belts and drive for each operating condition. Get the expert advice of AMERICAN DRIVE SELECTION SERVICE.
2. Keep belt tension at proper level . . . don't overload belts or permit slippage. American Econ-O-Matic Drives automatically control belt tension and thus *double* belt life.
3. On both new and existing installations specify American Econ-O-Matic Drives — They will provide that 100% greater belt wear.

American Econ-O-Matic* V-Belt Drive

Cuts Belt Wear 94.3% in Candy Factory

"During four years of service, we've hardly spent a nickel on maintenance of the **American Econ-O-Matic V-Belt Drive** that operates our plant ventilating fan," declares Mr. H. B. Thompson, Chief Engineer, Peter Paul Candy Company (Collins Division), Philadelphia.

Before the **Econ-O-Matic Drive** was installed belt slippage was troublesome, and belts had to be replaced about *every two months!* Fan and motor bearings frequently had to be replaced.

After the **American Econ-O-Matic V-Belt Drive,** complete with Wedgbelt Pulleys, four Wedgbelts (V-belts), and American Motor Base, was installed, belt life increased 1800%!

1. No new bearings have been needed for either fan or motor in four years.
2. Fan speeds are being maintained, providing higher efficiency and savings in power.
3. Maintenance costs in man-hours and materials have been cut drastically. Scarce materials are being *conserved.*

New! The American Pulley Company
4275 Wissahickon Ave., Philadelphia, Pa.

The **American Econ-O-Matic Drive Catalog.** Tells in words and pictures how to double belt life. Get your copy.

My Name _____

Position _____

Company _____

Address _____

American Pulley Company
PHILADELPHIA, PA.

S., Soviet Agree | Germans Claim

a 75-ton kick in the panzers!

Confidence is the strong and good cousin of that horrid word complacency. Most Americans are confident, few are complacent today. Confidence is our heritage, bequeathed to us by the pioneers, and nurtured by headlines of industrial marvels.

From the day when the Flatiron Building made news, to the colossal statistics of Grand Coulee, we have become firmly convinced that no task is too great for our vast construction industry.

That conviction is justified. A year before Pearl Harbor Sunday was anything more than a gleam in treacherous oriental eyes, our engineers and contractors were moving earth faster than it had ever been moved before . . . in preparation for projects which since have made our skyscrapers and giant bridges look like mere trial heats.

You know part of the story. We can't tell it all . . . complete aluminum plants built between Christmases . . . whole farms transfigured into bomber plants in less time than elapses between crops of corn . . . great shipyards in operation today on inlets that were frog ponds when the "Battle of Britain" was at its height.

How were these miracles of construction performed?

We can't call it genius. Germany, in particular, has many great engineering minds, yet the entire Axis is outstripped by our capacity to do big jobs fast.

We can't explain it by just calling it skill and experience. The new shipyards prove that . . . our skilled and experienced shipbuilders were absorbed by navy construction long ago. Yet we have met each new quota of cargo shipbuilding. Deep in our hearts we all know industry will meet whatever quota may be needed however impossible that may seem now.

▶ Some of these cargo ships and shipyards are being built by landlubbers . . . by men who knew nothing of the sea, but who were hell on reading blueprints and at designing and operating complicated machines.

There are several reasons why ordinary Americans become Supermen when faced by "fantastic" construction jobs.

▶ The first reason is the intrepid spirit of the management and men of American construction. With a slide rule in his hand, the most meek and stoop-shouldered of American engineers becomes a high adventurer. He is willing to gamble that the machines and men at his command can lick anything this side of the fourth dimension.

The second reason is motive power. The leaders of our construction industry have always had the guts to gamble the cost of big machines to do big jobs. Probably the rest of the world combined cannot match our array of power shovels, scrapers, bulldozers, compressors, welders, motors and engines for moving and moulding earth, water, steel and stone.

The third reason is men. A shovel weighing 75 tons needs a "75-ton mind" at the control levers . . . American labor takes to machinery as a co-ed takes to "swing."

The fourth reason is versatility. The construction industry is used to turning corners at high speed . . . to an organization that has built railroads, cathedrals, bridges, and movie palaces, making a munitions plant in a hurry just means more men, more machines and more night work, and more of that good American ingenuity.

In recognition of the miracle of war production—accomplished through the cooperation of American management and labor with the W. P. B. . . . . this advertisement is published by the McGraw-Hill Network of Industrial Communication.

P.S. The fifth reason is "mobilized information"

Through a distinctively American process, the Industrial Press, trial and error are reduced to a minimum. Information on successful new techniques flows freely from job to job.

If a factory in Kansas succeeds in laying the dust and stopping ruts in its parking lot, an engineer with the job of quick-surfacing a jungle airport reads how it was done in a construction magazine.

If a shipbuilder finds he can cut construction time in half by building hulls upside down, other shipbuilders learn about it from their technical magazines.

At McGraw-Hill alone 153 editors and 725 field-correspondents are constantly combing construction as well as industrial jobs to find new and faster methods. This "know-how" is then routed through industrial magazines to every industry where it can be helpful.

In addition to the editors, many industrial advertisers keep men in the construction field to watch the performance of their machines. Their reports are used in industrial advertising to show operators how to make machines do more work and last longer in these days of shortages of time and metal.

. . . Now this advertisement contains a moral and "commercial." The commercial objective is obvious. The moral is this:

▶ Let's remember how well government, management and labor are getting along together in the face of visible peril. When the war is all over, we need have no fear of the invisible perils of peace, if we tackle our jobs in the same cooperative spirit.

THE McGRAW-HILL NETWORK

More than 1,000,000 of the executives, designers and production men, who give America her world supremacy in technical "know-how," use the editorial and advertising content of the 23 McGraw-Hill publications as a means of exchanging ideas.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

McGRAW-HILL PUBLISHING COMPANY, INC.
330 WEST 42nd STREET · NEW YORK

THE McGRAW-HILL NETWORK OF INDUSTRIAL PUBLICATIONS

American Machinist
Aviation
Bus Transportation
Business Week
Chemical & Metallurgical Engineering
Coal Age
Construction Methods
Electrical Contracting
Electrical Merchandising
Electrical West
Electrical World
Electronics
Engineering & Mining Journal
E. & M. J. Metal and Mineral Markets
Engineering News-Record
Factory Management & Maintenance
Food Industries
Mill Supplies
Power
Product Engineering
Textile World
Transit Journal
Wholesaler's Salesman

A Quick, Smooth, Uniform coating — assured by

BARRETT GALVANIZING AND HOT TINNING CENTRIFUGALS

BARRETT CENTRIFUGAL GALVANIZER is driven with high torque head and has an equalized disc brake for quick stop.

With these new Barrett machines for expelling excess metal from small parts after dipping in molten metal, faster and better work is assured which will pass the most rigid inspection for quality.

The method of handling work is simple and easy. Work to be processed is placed in a basket and submerged in a kettle of hot molten metal. When thoroughly heated, the basket with the work is transferred into the Barrett Centrifugal where the basket is revolved and the excess metal thrown from the work. A quick pick up and stop (from 2 to 3 seconds each) assures fast work. Then too, quick pick up snaps the excess metal from the work before centrifugal action comes into play. With Barrett Equipment excess molten metal can be quickly thrown off before the metal cools, thereby assuring smooth, even thickness of coating.

Barrett Centrifugals for Galvanizing with and without heated drums are available in capacities from 40 to 240 loads per hour handling from 5 to 100 lb. loads. For tinning, Barrett offers the #0 Centrifugal Machine, operated similarly to the Galvanizers. On threaded work, tinning is so exactly done that rethreading is unnecessary.

Barrett Galvanizers, combining convenience of operation with the utmost in speed and safety are developed to meet the requirements of actual use by men thoroughly familiar with this class of work. They are self-contained and occupy the minimum of floor space.

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

WALKER MAGNETIC CHUCKS — there's a WALKER for YOUR needs

No. 618 Bar-Pole Magnetic Chuck

Universal Swiveling Magnetic Chuck

You are sure to find the magnetic chuck that will exactly fit your requirements when you come to Walker. There's no guesswork because Walker makes all types and sizes, including Rectangular, Swiveling, Vertical Face and Rotary designs.

Then, too, you are assured of having magnetic chucks that are the product of long, specialized experience — chucks that are designed and built right for the specific service intended.

If you need special chucks for special purposes, Walker can supply them promptly and at reasonable prices.

You'll save time and money by specifying "Walker" on your next magnetic chuck order.

Style "D" Face Plate "Concentric Gap" Type

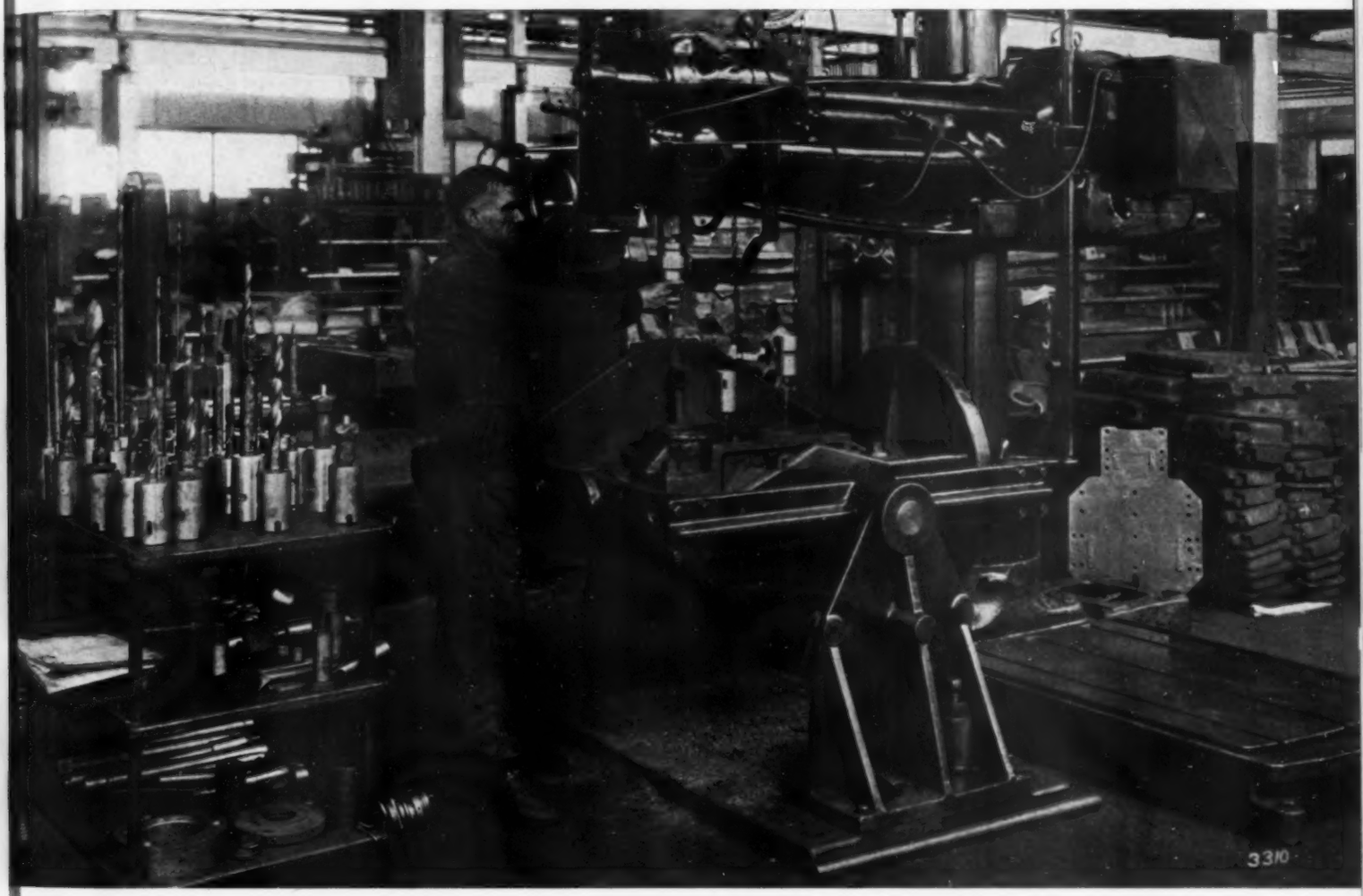
FULL DETAILS ON REQUEST

Ask for circular W-4

O.S. WALKER CO. INC. WORCESTER, MASS.

MODERN-MAGIC

QUICK CHANGE CHUCK AND COLLET EQUIPMENT



Has reduced the idle time of revolving spindles to practically zero. With this chuck in revolving spindle machines, tools can be changed while the machine is running without stopping or even slowing down the spindle.

MODERN TOOL WORKS

DIVISION OF CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER NEW YORK

MACKLIN GRINDING WHEELS

TOPS for thread grinding

In hundreds of production plants *MACKLIN* **THREAD GRINDING WHEELS** have been found to be most efficient. On practically every job a *MACKLIN* resinoid thread grinding wheel has solved the problem. Grain size depends on type of thread and finish required. Proper wheel and work speeds are very important. **A *MACKLIN* FIELD ENGINEER will be glad to assist you upon your request.**

"PROTECT Your PRODUCTION"

MACKLIN COMPANY

Manufacturers of **GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.**

Distributors in all principal cities

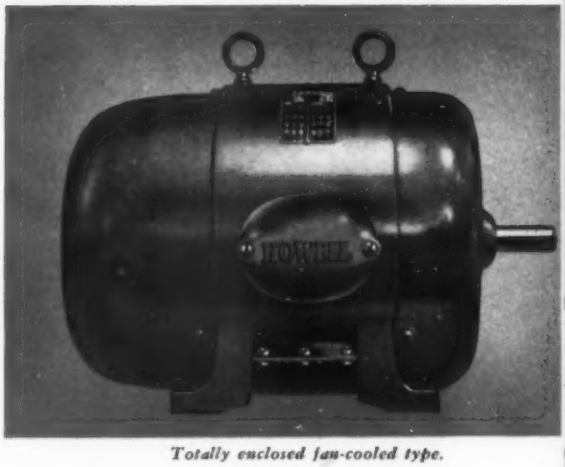
Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

All Howell Motors are dynamically balanced.

What is

THE HOWELL IDEA

in electric motors?



Totally enclosed fan-cooled type.

We may be dead wrong about what you want in an electric motor. We believe YOU want a motor that's got plenty of "get up and go" . . . plenty of "guts."

We know that by our putting more into every Howell Motor and working to closer limits of precision every step of the way, you get greater dependability — fewer breakdowns — freedom from delays . . . in a nutshell, that's the Howell Idea in Electric Motors — precision-built!

We're not satisfied to produce just good motors! We strive to build the BEST!

In vital war work, in the machine tool industry, in the aviation and chemical industries, in the building of trucks, tanks and ships . . . thousands of operations are depending on Howell Electric Motors. On all these tough jobs Howell Motors are coming through!

Your satisfaction! That's what counts with us. And that's what we are counting on to continue the good name of "Howell" . . . when this emergency is over. We're working exclusively now on "top priorities" for war essential industries.

Call in the Howell Representative. You can profit by the Howell Idea in Electric Motors!

The **HOWELL IDEA**
in Electric Motors
precision-built

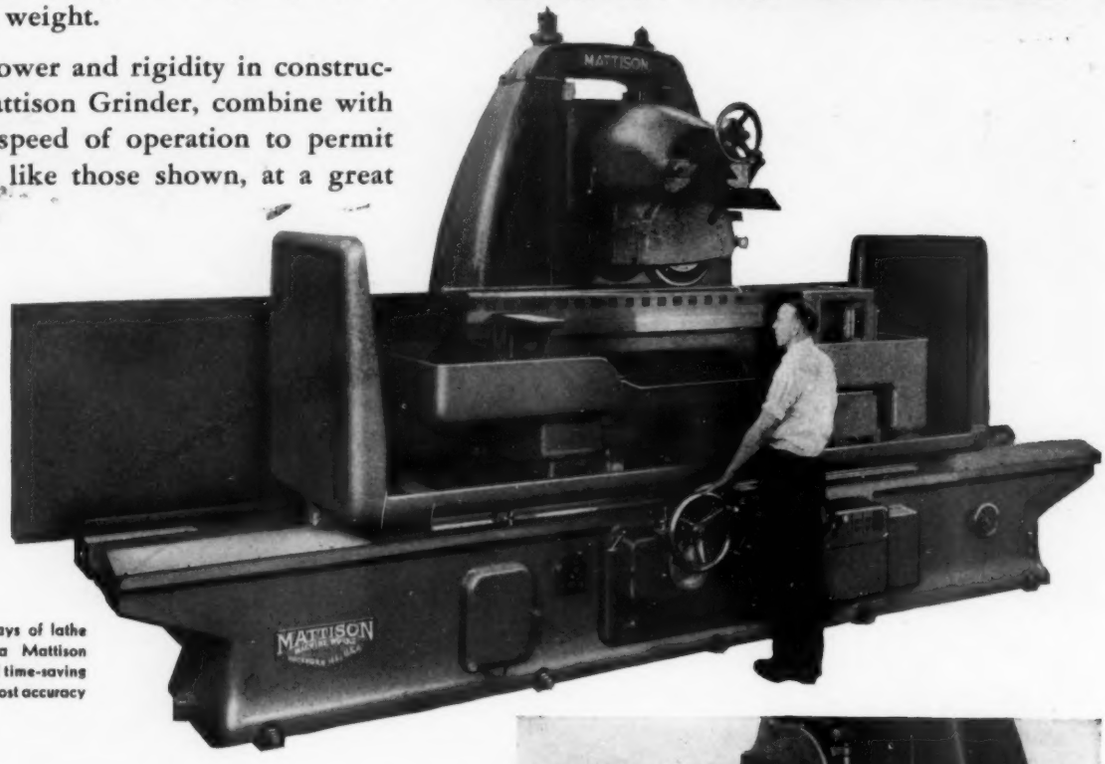
HOWELL ELECTRIC MOTORS CO.
HOWELL, MICHIGAN
Representatives in All Principal Cities

HOWELL ELECTRIC MOTORS COMPANY ★ MANUFACTURERS OF ELECTRIC MOTORS SINCE 1915

Precision Surface Grinding on a BIG SCALE

Mattison Surface Grinders are providing a fast, economical and exceedingly accurate method for finishing parts weighing up to several tons in weight.

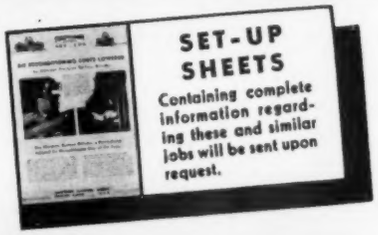
The High-Power and rigidity in construction of the Mattison Grinder, combine with accuracy and speed of operation to permit handling jobs like those shown, at a great saving of time.



● V-shaped and flat ways of lathe bed being ground on a Mattison Grinder. A practical and time-saving method for grinding to utmost accuracy and smooth finish.

● Five ton lathe bed with hardened steel ways. Ways and heads of hold down bolts ground complete in one setting. Time is saved; a more accurate job is obtained.

● Three ton heading slide previously hand scraped — now ground in 62% less time. A fine finish and close accuracy is secured with no scraping necessary.



SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

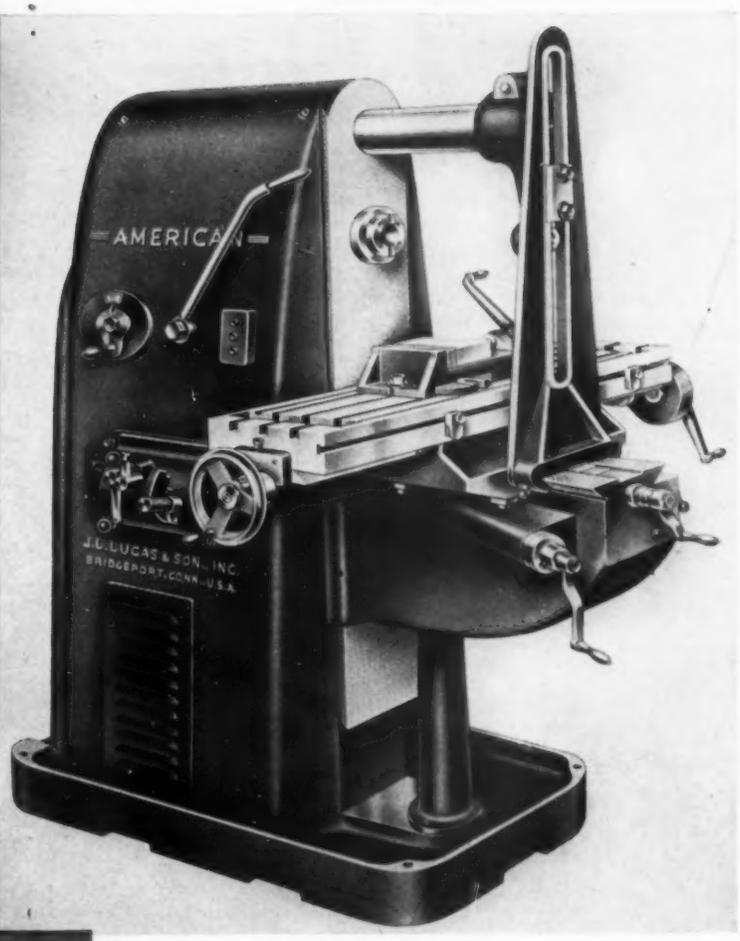
4 FEATURES

No. 2 AMERICAN PLAIN MILLING MACHINE

that assure

- **SPEED**
- **ACCURACY**
- **CONVENIENCE**

in munitions manufacture



1. INFINITE SPINDLE SPEEDS

Ability to select the proper speed for the work required is obtained instantly while machine is in operation, by a single direct reading dial control within easy reach of the operator for efficient operation.

2. MOTOR-IN-BASE DRIVE

Machine is driven by the U.S. Vari-Drive ball bearing equipped motor located in base. Drive to spindle is by multiple Vee belt through TWIN-DISC Duplex Machine Tool Clutch.

3. STANDARDIZED SPINDLE NOSE

Spindle, accurately ground to size, is of heat-treated chrome-nickel steel and runs in heavy phosphor bronze bearings compensated for wear and equipped with alemite lubrication fittings. Flanged spindle nose is standardized having a number 40 taper.

4. STURDY CONSTRUCTION

Column is heavily proportioned and houses motor drive and all power shafts. Table is designed for long-lived alignment and permanent shape. Working surface of table is provided with generous oil pockets and with three Tee-slots.

Delivery 8 Weeks With High Priorities

OTHER FEATURES AND DETAILS

. . . table provided with both power longitudinal and transverse feeds.
. . . all speed changes, feed changes, push button control and clutch lever centrally located.
. . . table working surface: 46"x10½".
. . . longitudinal power feed: 25".
. . . transverse power feed: 9".
. . . vertical hand feed: 19".
. . . spindle speed range: 25-500 R.P.M.
. . . geared feeds: 16; (range) .005 to .212" per revolution of spindle.

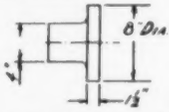
WRITE AT ONCE FOR
Bulletin giving Detailed Description and Specifications

J. L. LUCAS & SON
INCORPORATED
BRIDGEPORT, CONN. U. S. A.

1. INTERRUPTED CUT ON BOILER PLATE RINGS FOR GUN MOUNTS

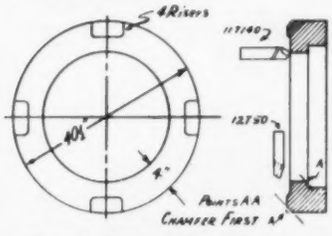
Material: Flame Cut Boiler Plate
Speed: 14 RPM; 190 ft./min.
Roughing: Feed 1/32"—Depth 3/16"
Finishing: Same Speed and Feed

2. ROUGHING AND FINISHING 8" DIAMETER GEAR BLANKS



Material: Rough Forgings SAE 1045
Speed: 165 RPM; 340 ft./min.
Turning O. D.: Feed .010"—Depth 1/8"
Facing: Feed .005"—Depth 1/8"

3. FACING AND BORING ALUMINUM RING CASTING

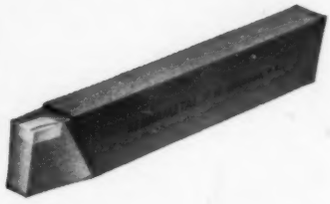


Material: Aluminum Bronze Casting
Speed: 19 RPM; 200 ft./min.
Facing: Depth 5/16"
Boring: Feed .011"—Depth 3/8"

On these 3 operations

KENNAMETAL* performed SUCCESSFULLY after ordinary carbide tools had failed

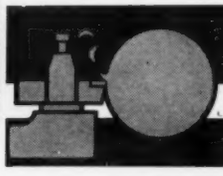
KENNAMETAL tools were used as standard on each of the jobs illustrated at left, after other carbide tools tested had failed to perform efficiently. All three operations were accomplished easily with KENNAMETAL, at the economical speeds and feeds mentioned.



Because of similar superior performances on many types of jobs, KENNAMETAL is decreasing machining time and saving money for manufacturers throughout the country. The KENNAMETAL representative in your district will gladly survey your tool requirements and demonstrate how KENNAMETAL can save you time and money. Write us.

KENNAMETAL THE All American CARBIDE

*** INVENTED & MANUFACTURED IN U. S. A.**

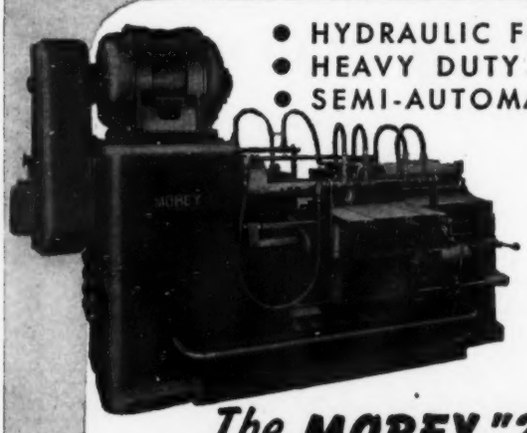


McKENNA METALS Co.

103 LLOYD AVE., LATROBE, PA.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York
Exclusive of Canada and Great Britain

Suitable for 105 M.M. to 155 M.M. Shells



- HYDRAULIC FEED
- HEAVY DUTY
- SEMI-AUTOMATIC

The MOREY "27" SHELL LATHE

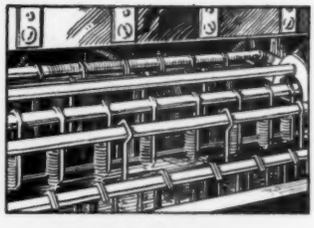
Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction

The HYDRAULIC FEED insures an almost effortless operation. Rigid enough to use carbide tools to their full capacity—entirely self-contained—no outside or auxiliary equipment required! Details in Circular 715—ask for it.

MOREY MACHINERY CO., INC

410 BROOME STREET • NEW YORK, N. Y.

FASTER WAY TO REMOVE SMUT



NEW Specialized Oakite Material Speeds Smut Removal From Cold-Rolled Steel

Removing smut is usually a hard job. But it needn't be! A NEW Oakite material . . . specially designed to give FASTER, improved results in electro-cleaning all types of cold-rolled steel . . . is now available! Provides effective combination of active smut-removing, emulsifying and wetting-out properties. Write, wire or phone TODAY for details of this NEW remarkable Oakite war development.

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK, N. Y.

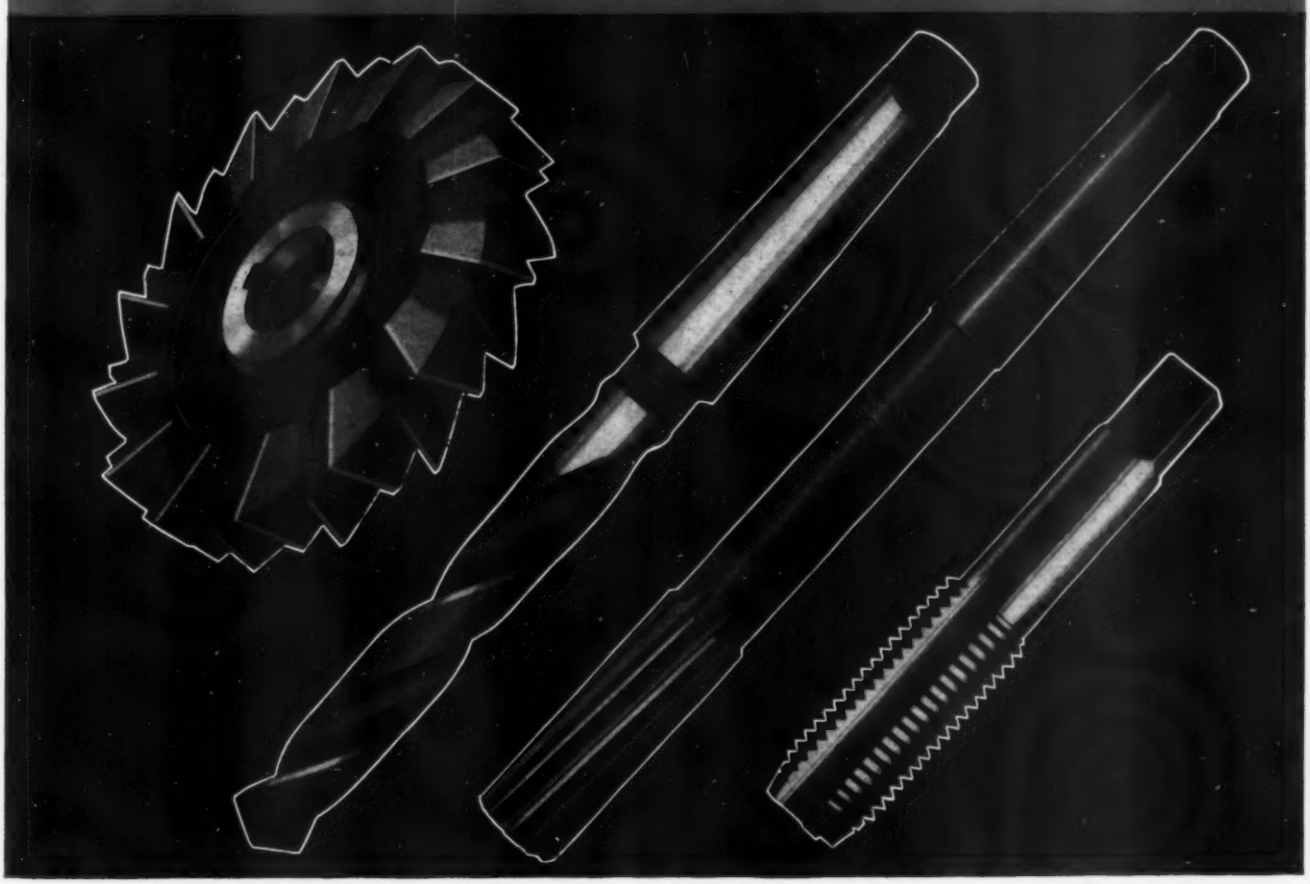
Representatives in All Principal Cities of the U. S. and Canada

OAKITE *Specialized* **CLEANING**

MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

BOOST "MACHINE MORALE"

The best of machine tools become better ones — do more work, with greater precision, with fewer stops — when equipped with highest quality cutting tools.



MORSE THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

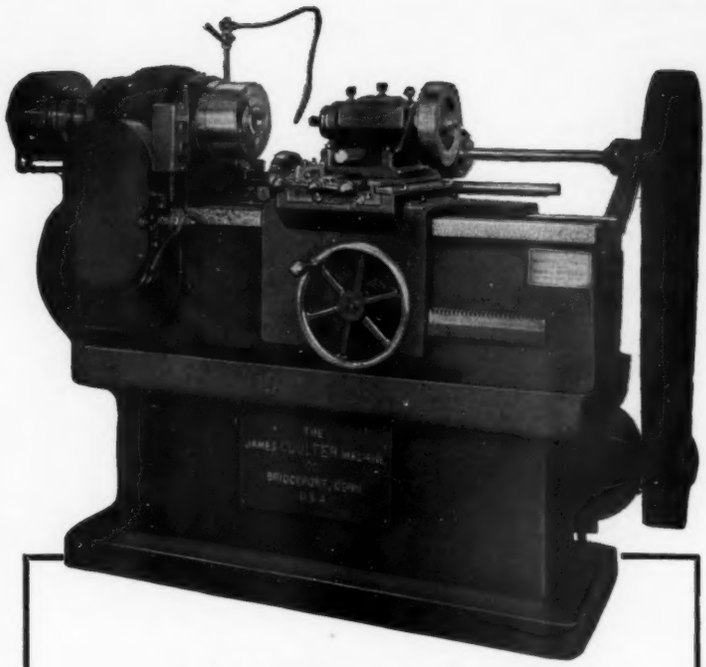
NEW YORK STORE: 130 LAFAYETTE ST. - - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

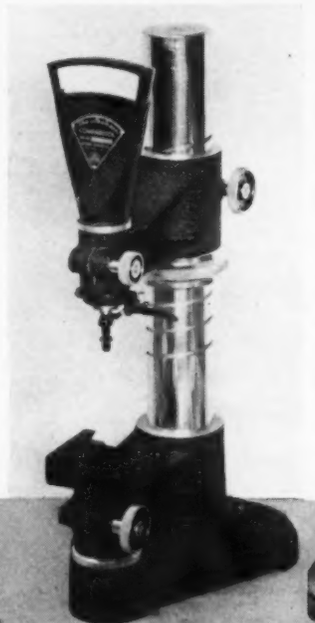
The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

USE
THE SCHERR COMPARITOL
for
SPECIAL MEASURING PROBLEMS

Used in leading plants for precision inspection to 1/10,000" on plug gages, cylindrical ground work, screw machine parts, flat pieces and other types of work, the SCHERR COMPARITOL can be furnished with special tables, anvils and spindles to meet your specific problem.

The COMPARITOL is available in two sizes, the Standard measuring from 0 to 6" and the Heavy Duty from 0 to 8"; range is .004" plus and minus graduated to read to 1/10,000.

WRITE TODAY FOR FOLDER, QUOTATION AND DELIVERY DATES



THE SCHERR COMPARITOL can be furnished with attachments as follows:

- Measuring Head only for building into fixtures, for special measuring applications.
- Ground and lapped flat table (4" x 4") to accommodate heavy plug gages and large work.
- Hardened and ground V-blocks in various sizes for detecting out of round.
- Back stops for attachment to table for fast production checking.
- Feeler points with hardened steel balls, tungsten carbide, diamond and sapphire tips.
- Anvils of various lengths and widths, with or without serrations for special types of work.
- Ball anvil for measuring very thin work such as crystals, laminations, etc.

THE SCHERR COMPARITOL will aid in solving your own particular inspection problem. Write for complete details.

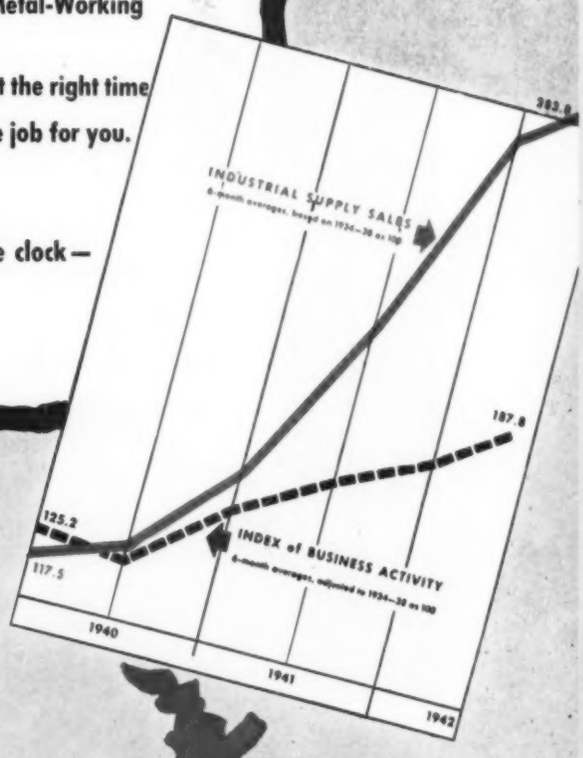
GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK N Y

THIS IS A WAR OF *LOGISTICS*

Between San Francisco and Sydney lie 8,000 wet miles.
From New York to London there are 4,000 storm-tossed ones.
New York to Murmansk is almost 5,000.
Hitler battles 1,400 miles from the Ruhr to Russia,
With American-built bombers at both ends and along the way.
Hirohito struggles 3,000 miles from Tokyo to Rabaul . . .
With Uncle Sam's submarines under the waves and his bombers above.

Yes, this is a war of logistics—the military word for the science of supply—
Supplies of planes, tanks, trucks, guns, shells
To the right place, at the right time.
For both the strategy and the tactics of these United Nations
Depend on the logistics of these United States.

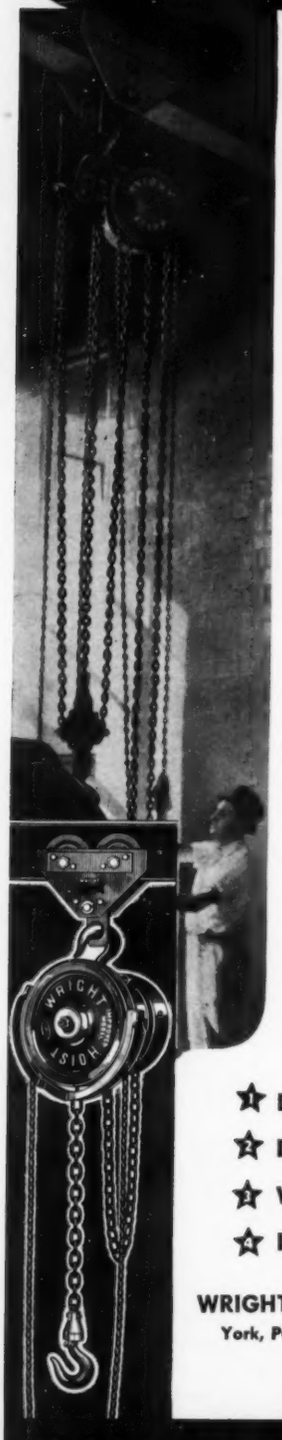
That's why supplies within the United States, and within Metal-Working
Have become so important.
Metal-Working must have the right tools at the right place at the right time.
Better than anyone else, your Industrial Distributor does the job for you.
He's a master of industrial logistics.
Hence the sharp increase in war business through him
Is but recognition of efficient services rendered 'round the clock—
Recognition for sound distribution methods
That have now proved their value under fire . . .



KEEP YOUR SUPPLY LINES OPEN BY BUYING THROUGH YOUR INDUSTRIAL DISTRIBUTOR

Published in the interest of the industrial distributor by
MILL SUPPLIES, 330 West 42nd St., New York, N. Y.
The Magazine of Industrial Distributors and Their Salesmen

Make your "ON GUARD" Equipment Last Longer



WRIGHT *Improved High-Speed* HOISTS

Too often the hoist that is on stand-by duty—*"on guard"* for instant action in case of emergency—is neglected by the maintenance man. Don't neglect your hoists. Make them last longer by regular and proper maintenance. Here are a few suggestions:

Put the Grease Gun to Work!
A **WRIGHT HOIST** needs thorough lubrication once a month. Keep the load chain well-lubricated, too.

Don't Overload Your Hoist.
While **WRIGHTS** are famous for their ability to stand abuse, this is no time to abuse machinery. Overloading results in a stretched chain which cannot seat itself properly in sheave pockets, thus accelerating wear.

Watch the Load Hook.
WRIGHT hooks, drop-forged from special steel, give visible warning of overloading by slowly opening. Don't continue to use hooks that have stretched.

Inspect Your Hoists Regularly.
Where properly maintained, **WRIGHT HOISTS** have given continuous, trouble-free service for 20 to 25 years. Just to summarize—remember—

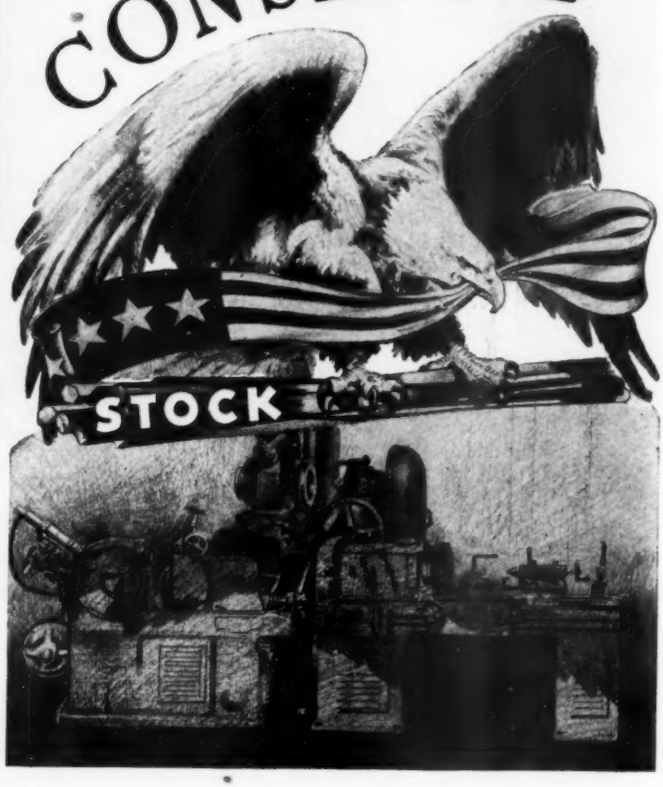
1. **Don't forget the grease gun**
2. **Don't overload your hoists**
3. **Watch the load hook**
4. **Inspect your hoists regularly**

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, San Francisco, New York

In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

CONSERVE



Under the wings of the Eagle are America's resources of steel. No longer ours to use as we choose, — wastefully or to little purpose. And there's little purpose today in bulky machine parts, drafted to models of the Early Steel Age!

ALLEN Hollow Screws permit use of lighter machine parts with no loss in essential rigidity of assembly. They assist in maximum streamlining. They save stock on flanges, lugs, all projections or areas for screw fastenings.

Because "Allens" are stronger, *smaller* screws can be used. And with Allen hex keys they can be set up in "tighter" places. Here you combine the most metal-saving type of screw; the most metal-saving form of wrench, — *both* saving metal in machines . . .

Call on your local Allen Distributor to expedite your orders to the very utmost under present stock-shortages.

THE ALLEN MFG. COMPANY
HARTFORD, CONNECTICUT, U. S. A.

DETREX MEN know how to analyze your metal cleaning requirements . . . to show the men in your production departments how machines can be operated most efficiently and economically . . . to recommend how solvents can be saved . . . and to cooperate on every phase of your metal cleaning processes.

Ever since Detrex products were first introduced, the men who have represented this company have always been thoroughly experienced in every phase of metal cleaning. Their "follow-through" has been continuous wherever Detrex machines and chemicals are used.

With today's new metal cleaning problems and demands for faster, more efficient production, Detrex Service can be of greater help to you than ever before. No obligation, of course.

CLEANING ENGINEERS DETREX DETROIT REX PRODUCTS

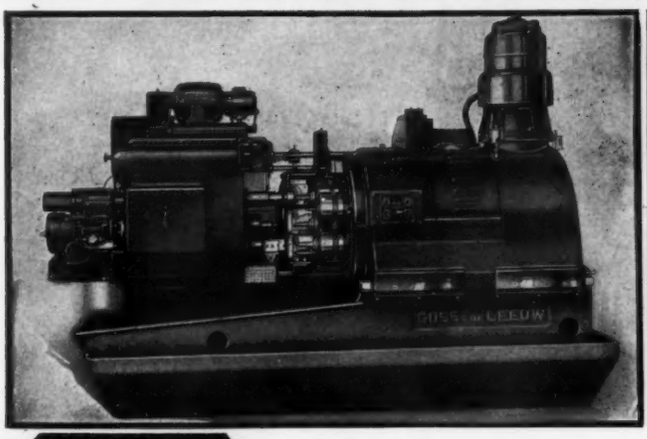
SOLVENT DEGREASING and ALKALI CLEANING

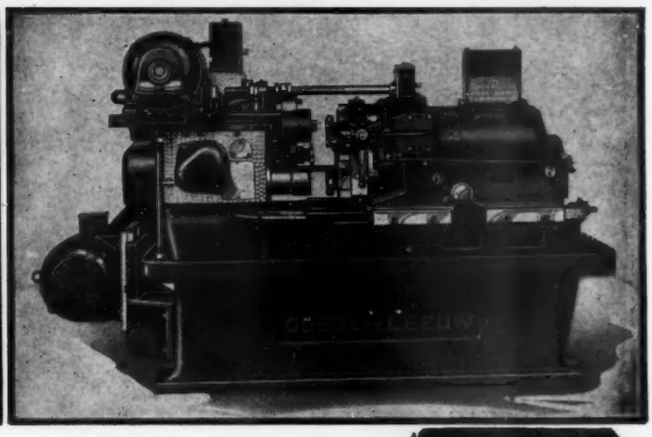
DETROIT REX PRODUCTS COMPANY

13023 HILLVIEW AVENUE • DETROIT, MICHIGAN

Branch Offices In Principal Cities of U. S. A. — In Canada: Canadian Hanson & Van Winkle Co., Ltd., Toronto, Ontario

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Pre-loaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

A NEW HIGH SPEED SMALL PARTS MILLER with Auxiliary Power Feed—THE No. 3 WIGGLESWORTH

. . . assures speed-up in production

This new machine will enable you to handle your small milling in less time and at low investment cost. Its rigid construction can be depended on to assure long-lived accuracy under long-hour service.

In the No. 3 WIGGLESWORTH are combined the usual features of the conventional hand miller with the sturdiness of larger machines making it a particularly valuable machine of great versatility and high production capacity. Equipped with the single "T" slot table, this machine is ideally suited to small parts production work of all kinds.

Outstanding features include:

. . . table feed by hand or power
. . . hardened and ground, spindle mounted on Timken precision roller bearings
. . . planetary gear feed gear mechanism
. . . automatic table feed
. . . motor in base drive through V-belts to intermediate shaft to spindle
. . . Standard No. 40 Milling Machine Taper Spindle

SPECIFICATIONS

Lever feed to table—10"
Power feed to table—20"
Transverse feed—5¼"
Vertical motion to knee—10"
Number of feeds—6
Number of speeds—6 from 150 to 800 R. P. M.
Floor space—42"x44"

SEND FOR COMPLETE INFORMATION

WIGGLESWORTH MACHINE TOOL CO.
195 Bent St., Cambridge, Mass.

Make AO YOUR Arsenal for ALL Your Eye Protection Needs

Protecting workers' eyes from industrial hazards calls for systematic study, careful analysis, long-term planning. No matter how competent you are to set up and carry on an eye protection program in your plant, AO can bring you additional constructive help, valuable cooperation.

We invite you to take full advantage of our facilities. Call for the services of a trained AO Safety Engineer. Ask to have a survey made of your plant to uncover *every* eye hazard. Make use of AO posters, unique eye protection charts, and safety literature. Keep a complete AO Safety Equipment Catalog at hand. Depend on rapid, efficient service from a nearby AO branch office. Select the goggles you need from the *complete* AO line—each type scientifically designed for lightest weight and greatest comfort consistent with maximum protection. Get acquainted with an AO Safety Representative—he can help you in your fight against eye accidents.

American AO Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

PRODUCES A ROUND CORNER AUTOMATICALLY!

With machines running at maximum feeds and speeds on war production, accurate—and fast—face mill grinding becomes more important than ever. The Oliver No. 2 ARC Face Mill Grinder produces, in one continuous movement of the grinding wheel, the correct face and periphery on all types of face mills, and creates a round corner between these two surfaces, blending the corner exactly into the cutting edges. This is the form that results in maximum production and greatly reduced cutter breakage.

Only a few simple adjustments are necessary to set up for any cutter from 6" to 26" in diameter—for any radius from 0" to 2"—for any angle from 0 to 90 degrees—for any angle of "dish", plus or minus. And, because the wheel traverses the entire cutting surface at one stroke, it is necessary to index the cutter only one-third the number of times—saving valuable time in tool-conditioning. No. 2-A Machine also available for smaller work, 1" to 6" in diameter.

Face mills are expensive tools. Use Oliver Face Mill Grinders to keep them correctly ground for faster production, improved work and maximum tool economy.

OLIVER No. 2 ARC FACE-MILL GRINDER

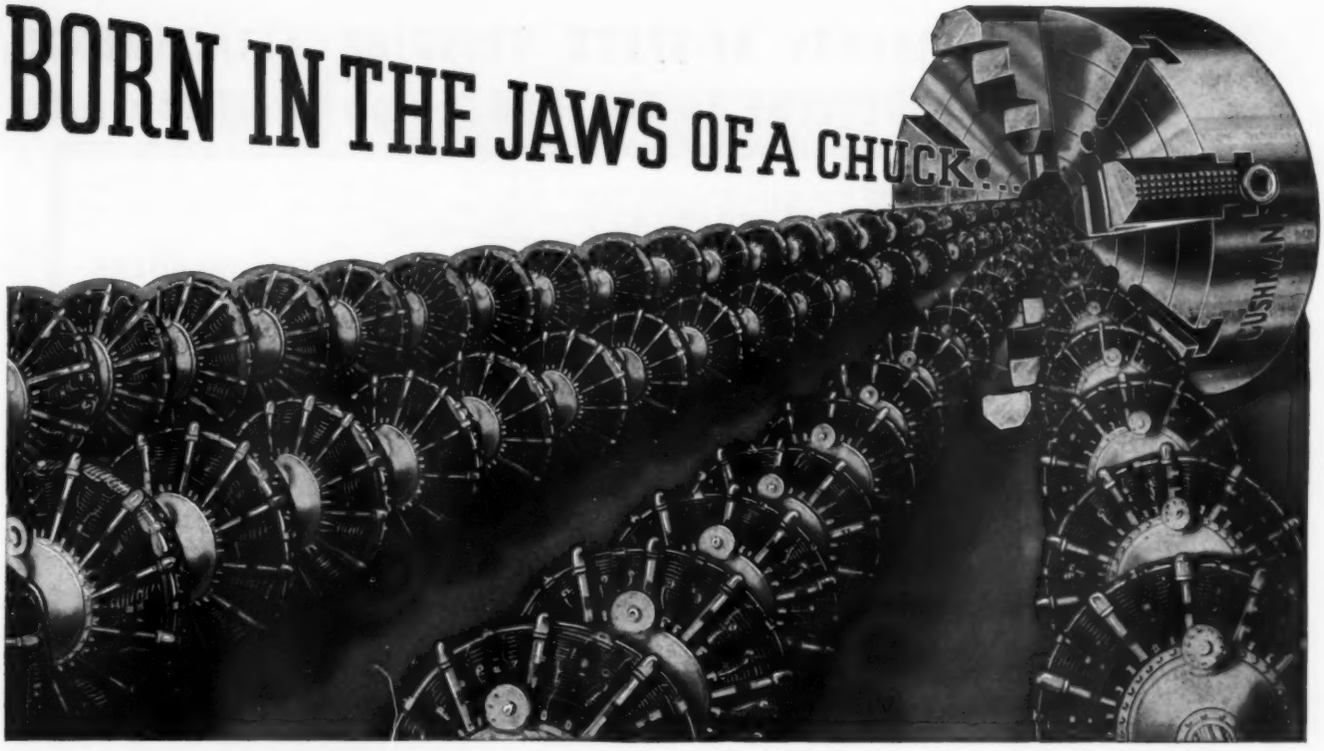
Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.
1414 E. MAUMEE STREET
ADRIAN MICHIGAN

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

BORN IN THE JAWS OF A CHUCK...



ALL PRECISION and a yard wide

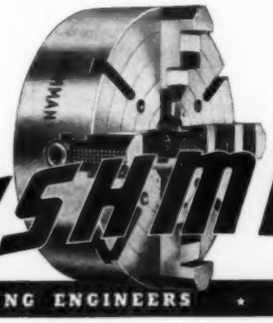
IF YOU are a manufacturer of aircraft engines, Cushman Chucks are helping you to keep 'em coming and "keep 'em flying". Cushman Precision and Cushman ability to "take it" from three shifts of hard-driving operators are helping you to keep ahead of stepped-up production schedules.

This may be the first time you have really used the great reserve of strength and sustained accuracy built into every Cushman Chuck. And we consider it part of our contribution to the winning of this war to help you get both maximum production and maximum service life from your chucking equipment.

We will be glad to send you a supply of "Chuck-Check" maintenance cards for distribution in your plant. You may find them particularly useful in training new operators.

The Cushman Chuck Company, Hartford, Connecticut.

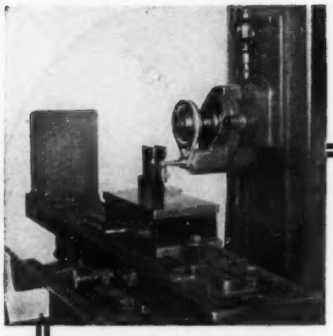
A WORLD STANDARD FOR PRECISION



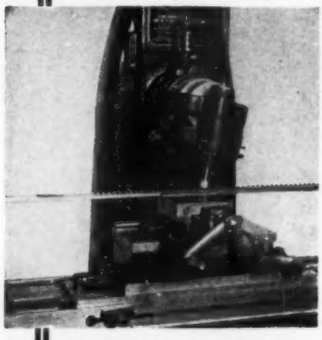
CUSHMAN

CHUCKING ENGINEERS • SINCE 1862

LIBERTY HI-SPEED GRINDING ATTACHMENTS SAVE TIME IN SET-UPS . . . *on precision jobs*



HORIZONTAL ATTACHMENT
Grinding Gaging Seat on Special Gage



VERTICAL ATTACHMENT
Grinding Clearance of Broach Teeth

More and more shops are taking advantage of the accuracy and speed on a wide range of tool, die and gage work assured by these new Liberty Grinding Attachments.

Designed for quick, simplified set ups — on Brown & Sharpe, Reid and other surface grinders — these precision-built, easily adaptable attachments provide for the widest possible variety of applications.

Investigate Liberty Hi-Speed Grinding Attachments for saving time in grinding gages, angles, slots, recesses and surfaces which are impossible to get at with large wheel. See for yourself how you can eliminate difficult and long expensive set-ups in which small wheels are a necessity.

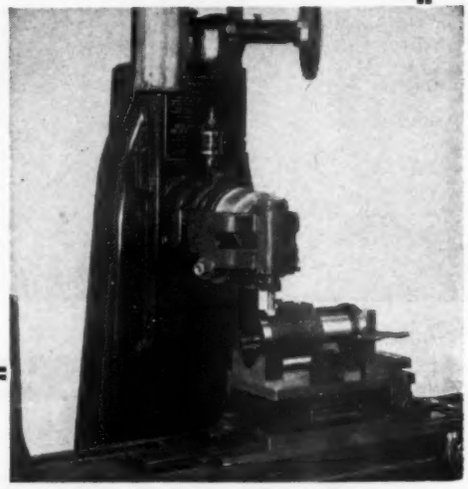
Available for horizontal or vertical spindles, these units can be shifted to numerous positions. Can be attached in a few minutes.

Assembled complete with any size bores, pulley belts and grinding wheels at no extra cost. Write for Descriptive Bulletin.

To facilitate shipment, kindly specify diameter of spindle head, type and make of grinder in ordering.

EQUIP YOUR GRINDERS NOW Prompt shipments on standard units can be made if orders are placed immediately.

VERTICAL ATTACHMENT
Grinding Rectangular Opening in Trigger Casing



LIBERTY TOOL & GAGE WORKS
PROVIDENCE • RHODE ISLAND

Simonds Saw and Steel Company, makers of quality saws since 1832, have this to say in their new general catalog—"Our precision method of grinding on new hydraulic rotary grinders produces perfectly flat and perfectly balanced saws which run true and cut better lumber."

Here is another world-known product that depends on

ARTER ROTARY SURFACE GRINDERS
for precision finishing.

Are you getting all possible production from your grinders? Arter engineering will help you to gain production-plus.

ARTER GRINDING MACHINE COMPANY
WORCESTER, MASS., U. S. A.

YOU CAN FORGET
Your Honing Problem!

Yes, sir! We know that's quite a claim. But we mean it. You CAN forget your honing problem. And, furthermore, we're eager to prove that you can.

No matter what your problem may be MID-WEST produces a honing stone that will solve it—and any MID-WEST engineer will be glad to help you select that particular stone.

Quite naturally you ask: "How can you guarantee to eliminate my problem?"

The answer, of course, is MICRO BOND, the remarkable new abrasive developed by Mid-West engineers that has completely eliminated guesswork from abrasive stone manufacturing. MID-WEST MICRO BOND honing and superfinishing stones are precision-made. Their hardness, grain structure and dimensional specifications are CONTROLLED to the precise degree required for any given job. That means uniformity between one shipment and another. And they are made to fit any standard lapping, honing or superfinishing machine. That means YOU can use them in your present machines.

Micro Bond envelopes each tiny grain—permits no "bunching," therefore eliminates scratching. Micro Bond stones also cut faster, wear down more uniformly and retain their operating efficiency about 20 per cent longer than average stones. And, lastly, Mid-West Micro Bond stones are "cool cutters"—generating up to 90 per cent less heat than do ordinary abrasives.

There's your answer, Mr. Production Man! That's why you can forget your honing problem. Why not let us increase your production by eliminating your honing slow-downs. We have capable engineers in most large cities of the United States. They are yours to command. Call them in and ask about MICRO BOND. Or, just fill out the coupon printed herewith. Mail it in—and you will hear from one of our representatives promptly. Samples are shipped from stock immediately.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Honing Stones

1960 E. MILWAUKEE AVENUE — DETROIT, MICHIGAN

Mid-West

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

- ★ *Honing Stones*
- ★ *Superfinishing Stones*
- ★ *Grinding Wheels*
- ★ *Emery Cloth*
- ★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

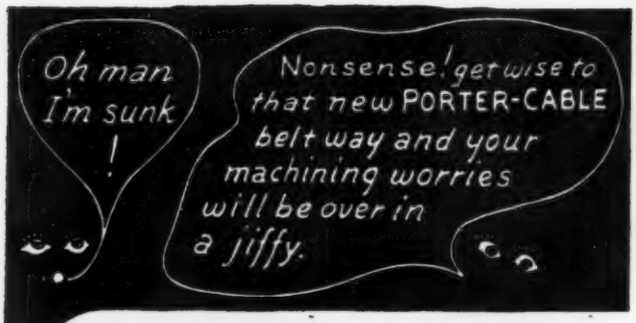
Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

Name _____

Company _____

Address _____

City _____ *State* _____



PORTER-CABLE'S

New Machining Method Performs Production Miracles

Large numbers of plants called on to do the impossible have met that challenge and, with the help of this new machining method, have made their original schedules look like "peanuts."

Handicapped through lack of large machine tools, they investigated the performance of Porter-Cable Wet-or-Dry Belt Grinders on some of their jobs usually done on millers, shapers, planers, grinders, or by other slower means, and were amazed at the high production, with toolroom accuracy, this new method accomplishes with ease.

CLOSE TOLERANCES —UNSKILLED HELP

Most jobs, by this method, are done either freehand, or where extremely close tolerances (up to .0005) must be held, with simple, quickly-made fixtures. Experience is unnecessary. Small parts excellent for women workers—no dust, heating, warping or discoloring. Works metals, glass, plastics, hard rubber, fibre, etc.

PRODUCTION MEN AMAZED, ELATED

Frequent remarks from Production men who have put this method to work—"Broke our bottleneck." "Much faster and finer finish." "Didn't believe it until I actually saw it." "Increased our milling production five hundred per cent." "It certainly opened my eyes."

You'll say the same when you actually see this new method demonstrated—so ask us for complete details, without delay—without obligation.

Booklet explains New Methods. Write for FREE Copy Today.

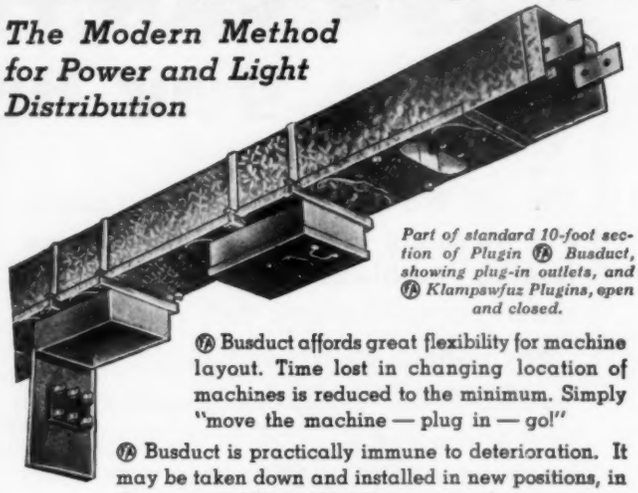
PORTER-CABLE MACHINE COMPANY

1725-7 N. Salina St., Syracuse, N. Y.

FA BUSDUCT

Feeder and Plugin Types

The Modern Method for Power and Light Distribution



Part of standard 10-foot section of Plugin FA Busduct, showing plug-in outlets, and FA Klampswfuz Plugins, open and closed.

FA Busduct affords great flexibility for machine layout. Time lost in changing location of machines is reduced to the minimum. Simply "move the machine — plug in — go!"

FA Busduct is practically immune to deterioration. It may be taken down and installed in new positions, in the same or different buildings, as need may require. Extensions may be made readily to existing installations. Moderate first cost is combined with low up-keep . . . Write for Bulletin 61, with complete description, applications and detail drawings of FA Busduct.

Frank Adam ELECTRIC COMPANY ST. LOUIS

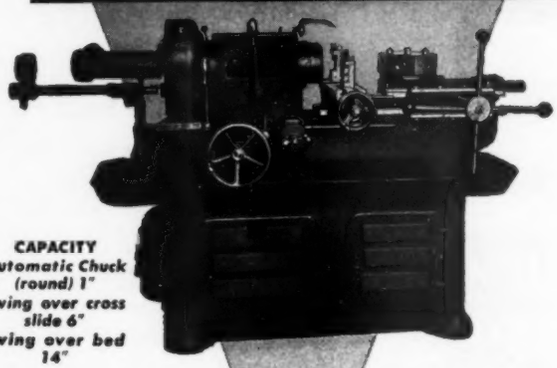
for ECONOMY - for HIGH SPEED PRODUCTION

The MOREY 2G

Back-Geared TURRET LATHE

Timken Bearing

Self-Locking Turret and Infinite Spindle Speeds



CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.

HERE'S AN EXAMPLE OF TIME SAVED *by Centerless Grinding*

OLD METHOD
GRINDING TIME, 1 PIECE, 7.12 MIN.
GRINDING TIME, 1800 PIECES, 12816 MIN.
SETUP TIME, 14 MIN.
TOTAL TIME, 12830 MIN.
CENTERLESS GRINDING
GRINDING TIME, 1 PIECE, 1.88 MIN.
GRINDING TIME, 1800 PIECES, 3384 MIN.
SETUP TIME, 60 MIN.
TOTAL TIME, 3444 MIN.
TIME SAVED BY CENTERLESS GRINDING METHOD — 9386 MINUTES!
USE STERLING WHEELS
WORK
REGULATING WHEEL
GRINDING WHEEL
ANGULAR TOP WORK REST BLADE

DOING jobs correctly by using the right grinding wheel is the easiest way to get work done quickly . . accurately! Finding the easiest way is important these days when the coming of victory is measured in terms of speed of production. Correct grinding is most important if you are to meet schedules.

The example shown above is but one of many time-saving ideas which Sterling engineers can suggest to speed up important grinding operations. Yesterday's methods are obsolete today . . get the facts about new grinding ideas from Sterling engineers who are contacting hundreds of busy industries these days.

Your centerless grinding problems can be readily solved by Sterling Grinding Wheels built to your special needs. Where accuracy, speed and lasting qualities are paramount, use Sterling!

There is no cost or obligation when you have the services of a Sterling engineer. One hour or less is often all the time necessary to arrive at a decision that may double your grinding efficiency! Write today for this important Sterling wartime service.

And-if you don't have a copy - ask for the Sterling Catalog No. 42. You will find it handy to have around for easy reference.

· STERLING ABRASIVES ·

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

★ PLANE PARTS
★ TANK PARTS
★ BOMB PARTS
★ SHELLS
★ GUN BARRELS

USE *Hammond* AUTOMATIC FINISHING MACHINES

MODEL-SB

ROTARY AUTOMATICS

For BURRING, BRUSHING POLISHING, BUFFING of PLATED or BASE METALS

Step up production of Aircraft Engine Pistons, Valves, Hexnuts, Spark-plugs, etc.; Tank Track Pins, Engine Cylinder Liners, Carburetor parts, Gears, etc.; Shells and Shell Cases, Fuse Bodies, Fuse Caps, Striker Plates, Setting Sleeves, Timer Bodies, to name just a few of many items.

CYLINDRICAL FINISHING MACHINES

FOR ¼" to 9" OUTSIDE DIAMETERS

Aircraft Landing Gear Parts, Universal Joint Shafts, Pistons, Cartridge and Shell Cases, Burster Tubes, Trench Mortar Bombs, Machine Gun Barrels, Throttle Shafts, Tubing and Rods present a few of the numerous uses of the "OD" Machine.

MODEL-OD

SEND SAMPLES TODAY FOR COMPLETE ENGINEERING REPORT

Hammond Machinery Builders INC.

1618 DOUGLAS AVENUE, KALAMAZOO, MICHIGAN
Eastern Branch, 71 West 23rd Street, New York City

Patent

UNIVERSAL BALL JOINTS

- Made in a range of 9 sizes for shaft diameters ¼" to 1⅝".
- Standard Joints have maximum angle of 38° from the straight line.
- Made by the largest manufacturers of UNIVERSAL JOINTS in Great Britain.
- Widely used in Machine Tools, accessory drives and on Aircraft.
- Certified 92% to 98% efficient by the British Government's National Physical Laboratory.

Catalogues on request.

The **MOLLART** *Engineering Co., Ltd.*

KINGSTON BY-PASS, SURBITON, SURREY, ENGLAND.
Telegrams: PRECISION, SURBITON.

Here's how it works! With P&H-Hansen Square Frame Welders mounted as dual units, you have *two* separate services of from 30 to 260 amps. each. *Two* operators can weld with 5/32" or 3/16" electrodes. For peak loads, simply hook the two machines in parallel and have their combined capacity for *one* operator.

Yet, whether you operate machines singly or in parallel, you make but one simple current adjustment. Arc response is automatic on all types of work. You can't go wrong. That's what makes P&H-Hansen the only true welding generator on the market — why you can't beat it for economy — and efficiency. Write for Bulletin W-26.

**Production has been stepped up to speed deliveries for essential war industries.*

Awarded the Navy "E" for excellence in war production, P&H displays it also as a pledge of future effort.

P&H FOR ALLOY ELECTRODES

P&H offers electrodes for practically every need — in welding stainless, for hard surfacing, resistance to impact and abrasion, as well as special types for welding cast and rolled armor plate, for building up cutting tools, etc. P&H engineers will gladly advise you on methods and procedures. Write us.

General Offices: 4514 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION

WELDING ELECTRODES • MOTORS • HOISTS P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATORS

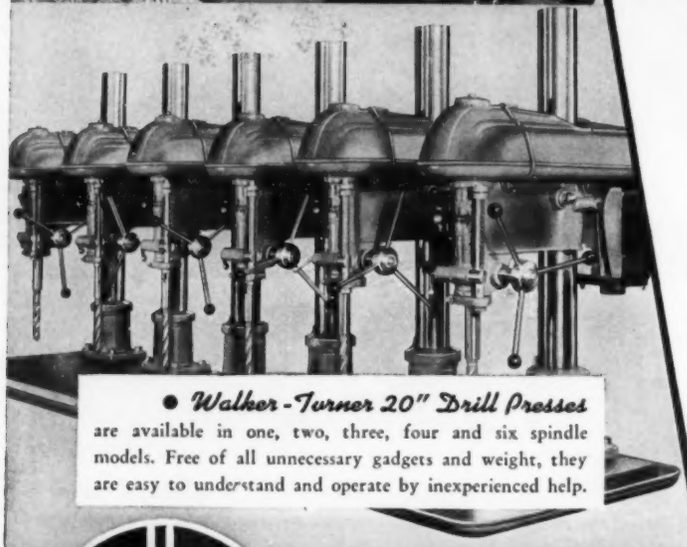
200% more production!

WALKER-TURNER *Power-Feed* DRILL PRESSES

● *This New 20" Power-Feed Drill Press* is designed for today's fast production schedules. Handling a multiple spindle model, an operator can easily turn out twice as much as on a single spindle hand-feed machine. And he won't wear himself out bearing down on a hand-feed lever all day. A bullet die maker, for example, operating a four spindle power-feed model turns out as much with one operator as four men did before on single spindle hand-feed machines. Prices, less motor, from $195. Shipment 4 to 6 weeks to war industries.

● *Send for literature.*

Walker-Turner Co., Inc.
4572 Berckman Street Plainfield, New Jersey

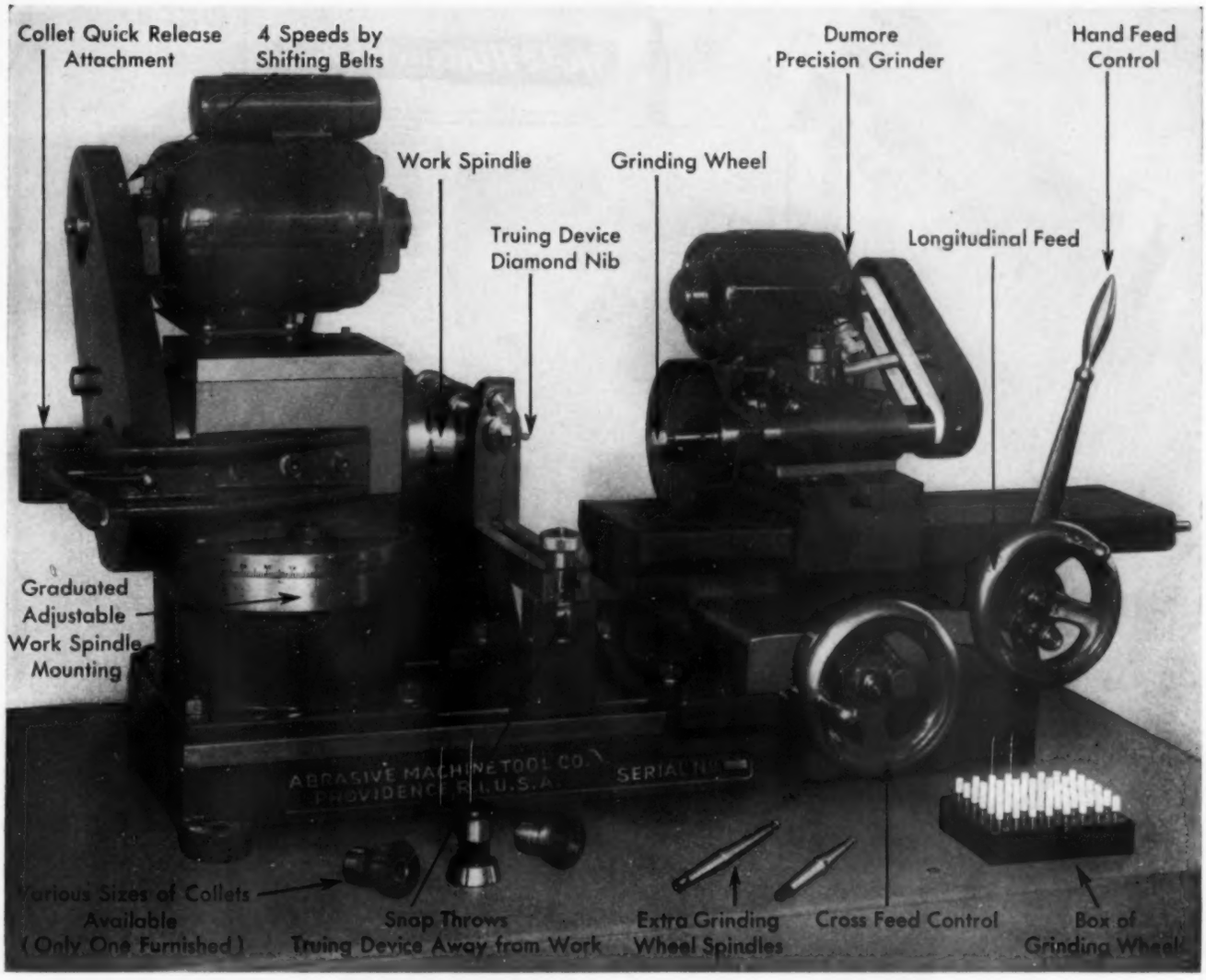


● *Walker-Turner 20" Drill Presses* are available in one, two, three, four and six spindle models. Free of all unnecessary gadgets and weight, they are easy to understand and operate by inexperienced help.

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

WALKER-TURNER MACHINE TOOLS
FOR METAL, WOOD AND PLASTICS

DRILL PRESSES · BAND SAWS · BENCH SAWS · TILTING ARBOR SAWS · LATHES
JIG SAWS · RADIAL SAWS · RADIAL DRILLS · BELT AND DISC SURFACERS · JOINTERS
SPINDLE SHAPERS · GRINDERS · FLEXIBLE SHAFT MACHINES · CUSTOM BUILT MOTORS



The NEW Abrasive No. IG Internal Grinder

The ABRASIVE No. IG has been developed recently to handle the large volume of manufacture requiring a highly accurate, easily handled, internal grinder. Typical of such work is the huge quantity of die work, particularly those used in bullet and cartridge manufacture.

This machine will grind holes up to 12" diameter, has a longitudinal travel of 8", and spindle cross feed of 3½". Cross Feed is provided with hand wheel graduated .001". Longitudinal Feed has graduated hand wheel .001" and positive stop with micrometer adjustment. These close graduations PLUS the rapid acting draw-in collet, and the quick operating hand feed, make the No. IG an extremely handy and accurate tool. It can be used also for external or cylindrical grinding within its capacity.

This Grinder is manufactured under the same careful supervision as the ABRASIVE Surface Grinders which have been known for years for their accuracy.

Study the illustration—then write for any further information, including price and delivery. Address —

ABRASIVE MACHINE TOOL COMPANY

Dealers in Principal Cities

EAST PROVIDENCE · · · RHODE ISLAND

TAP USERS Attention!

TOOL CONSERVATION is the topic of the day in metal working factories throughout the country.

If you are a user of Taps, our booklet entitled, "How to Get More Production from Taps" will help you not only to get more production but also to make your Taps last longer, cut down on spoiled work and machine down-time, and conserve the time of your Tapping operators.

Thousands of these booklets are already in the hands of Tap users—ask for your copy today.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

DETROIT PLANT: 5850 Second Blvd.
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GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

WITH D&T Tubular Micrometers you can maintain tool room accuracy on large, unwieldy work — check inside and outside diameter measurements in thousandths from 0" to 168" (in 6" steps). The feather-touch lightness of these precision instruments makes it easy to detect the slightest inaccuracy.

Durably constructed for long, hard service, D&T Tubular Micrometers have a light, rigid frame of hollow, cold drawn steel, with drop-forged ends welded on to hold the sliding ground bar and micrometer head. Available in crescent or bar types in 45 different sizes.

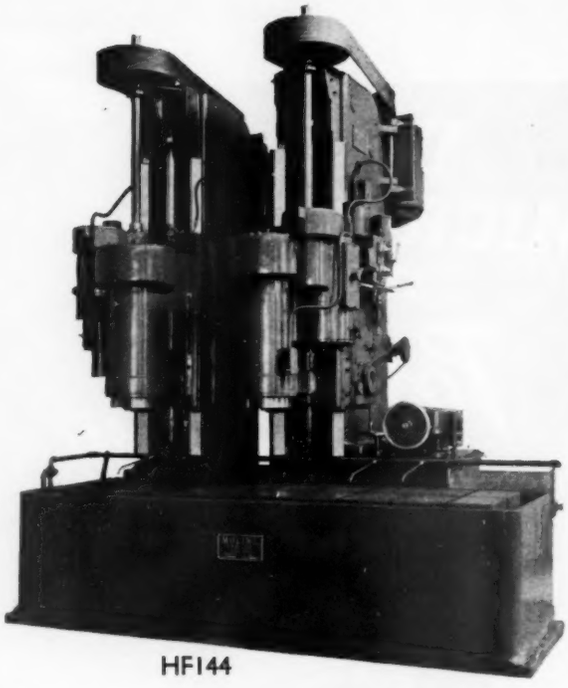
An indispensable tool for manufacturers of heavy equipment, for steel mills, paper mills, engine plants, and especially for producers of armament. Write for a copy of the new bulletin describing all D&T Tubular Micrometers.

DAVIS & THOMPSON CO. • MILWAUKEE, WISCONSIN, U. S. A.

AN AID TO DIESEL BUILDERS

• Four years ago, when this HF144 Diesel Connecting Rod Boring Machine was being built, we didn't know we were building for America's war effort. Now, by doing its regular job, this machine can contribute to the Axis defeat.

• The movable column can be set for center distances from 20 to 60 inches—Spindle speeds from 5.66 to 238 r.p.m. are provided—Hydraulic, push button controlled, automatic feed cycle for each spindle—An exceedingly rigid piece of equipment, built to do trepanning operations and will handle bores up to 12 inches in diameter.



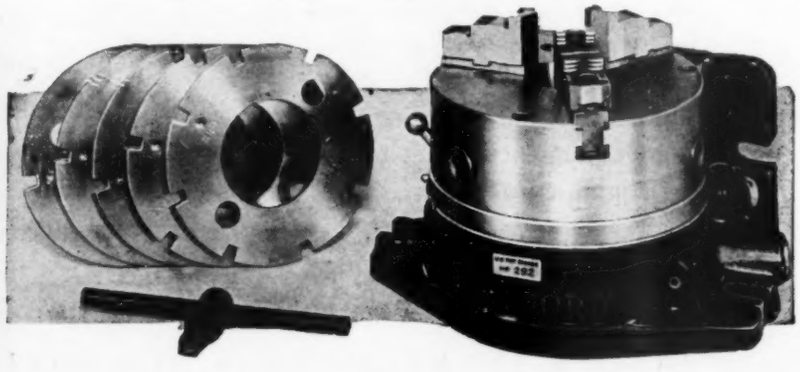
HF144

BORING • HONING • DRILLING • REAMING • TAPPING • SPECIAL EQUIPMENT

MOLINE TOOL COMPANY • Moline, Illinois

"HOLEHOG" ESTABLISHED 1901

FASTER, BETTER, MORE ACCURATE WORK assured by the HARTFORD SUPER-SPACER



This versatile spacing device—providing accurate indexing even under heavy cuts—is a time and money saver on milling, drilling, slotting and planing operations regardless of the quantity of pieces involved. The rapidity and accuracy of indexing—the savings in set-up time—the stepped-up speeds and feeds possible—are among the advantages which result in more and better work at lower cost. All possibility of error in indexing, even in the hands of an unskilled operator, is avoided by mask plates.

PUT THE SUPER-SPACER TO WORK NOW!

Take advantage of the production-speeding assured by the Super-Spacer now. Get all details of this time-saving spacing device immediately. Write TODAY!

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD CONNECTICUT

Bodine COMPENSATES for LABOR SHORTAGE

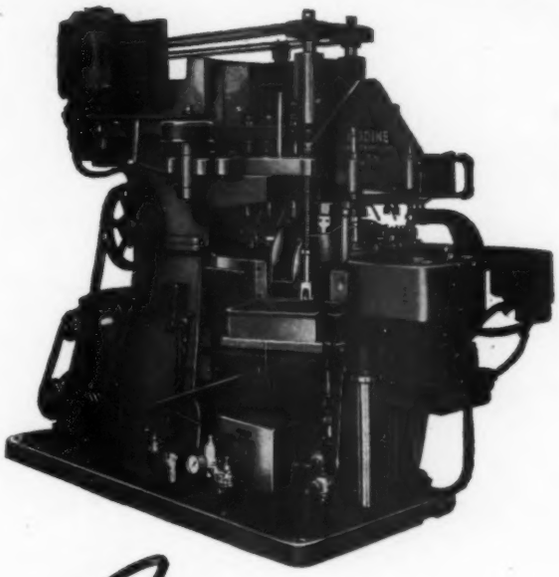
with MULTIPLE OPERATIONS

Check the figures on a Bodine machine production sheet. You'll immediately see the value of this automatic multi-operation principle to plants where labor shortage exists.

An indexing dial carries the work to a succession of accurately located spindles where parts are finished to closest tolerances by tools held either vertically, horizontally or inverted . . . or in all three positions.

The operator merely places the part in a self-clamping dial fixture and the rest of the cycle is automatic, even to the ejection of the work.

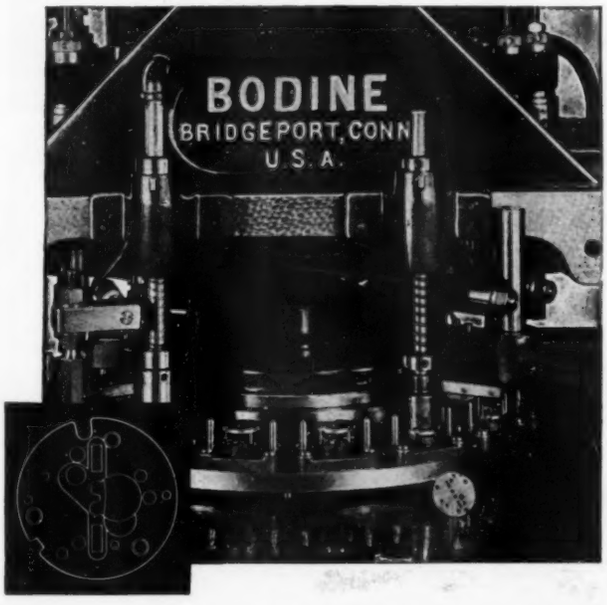
Thus more and faster operations are crowded into valuable hours, with maximum production from a one-man machine.



DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

Bodine machines are made in 6 sizes, some of which may be tooled to perform four operations at one stroke of the machine . . . in some instances finishing 2 parts to a single cycle of the indexing dial. Electric inspection gauges frequently control the accuracy of finished parts, while automatic protective devices prevent damage to tools, machine or product, as well as insuring safety to the operator.

Milling fixtures are completely adjustable in all directions, so that a change in the dial adapts the machine for many combinations of tooling set-ups.



TOOLING SET-UP FOR ORDNANCE PART

The Bodine 42-30, shown above, in a close-up of the dial, is tooled to drill accurately spaced holes in a delicate ordnance component. As the dial is automatically indexed to a station, each fixture is accurately positioned from master pins, by hardened bushings in the drill jigs. Seven holes are drilled (sizes .5mm to 2.8mm dia.) with tolerance for center distance .0004".

Bodine engineers will help you to solve production problems . . . from your drawings or sample parts.

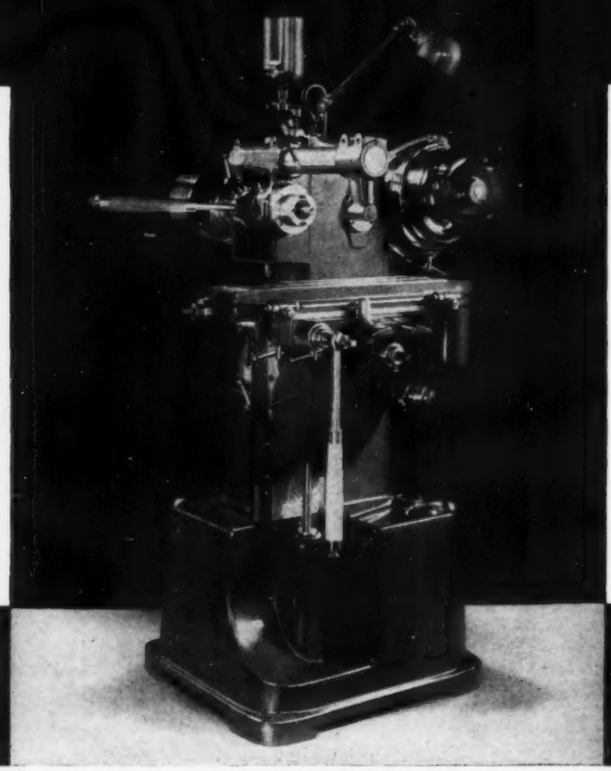
THE **Bodine** CORPORATION
BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

Precision, Sturdiness, High Production and Long Life

are combined in the

NICHOLS HAND MILLING MACHINE



Fast, close work on parts milling is assured by the Nichols Hand Miller. Ruggedness and in-built accuracy place this machine in the class of a modern production tool.

Valuable time savings, especially in tool room service, are offered by the "NICHOLS" because of its compactness and quick, easy set-up. Precision and outstanding versatility contribute also to the adaptability and productivity of this modern machine for tool room use.

An important feature of design which extends the utility and convenience of the Nichols Hand Miller is the vertical head. Operated by hand, the head can be locked in any position. It is also fitted with hand set depth stop. In addition to carrying the spindle, the head supports the heavy overarm for supporting cutting arbor.

Other features of this machine which has longitudinal and transverse feeds of 10″ and 7″ respectively are fully described in bulletin available promptly on request.

Send for Illustrated Bulletin, giving complete information

W. H. NICHOLS & SONS

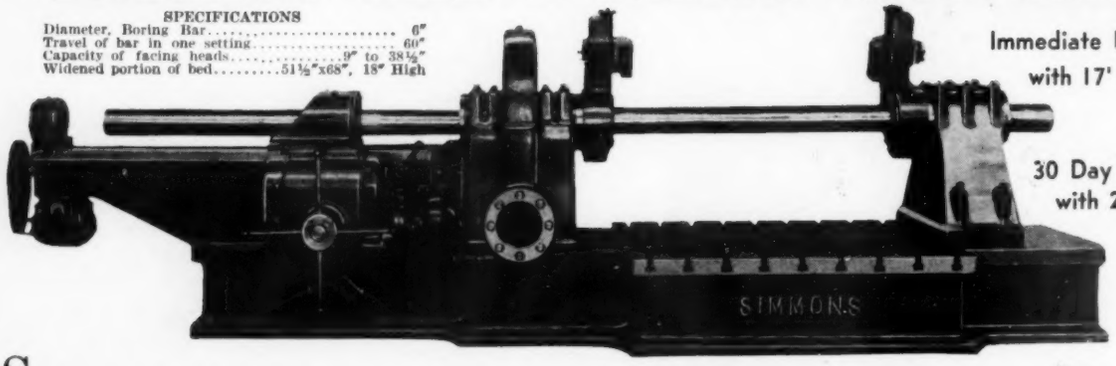
WALTHAM, MASS., U.S.A.

SIMMONS 6" BAR HORIZONTAL

BORING and FACING MACHINE

SPECIFICATIONS

Diameter, Boring Bar..... 6″
Travel of bar in one setting..... 60″
Capacity of facing heads.....9″ to 38½″
Widened portion of bed.....51½″x68″, 18″ High



Immediate Delivery with 17' Bar

30 Day Delivery with 24' Bar

SIMMONS 6″ Bar Horizontal Boring and Facing Machine has been designed for current war production requirements. The bed is heavily ribbed to insure maintained alignment.

Equipped with Simmons Micro-Feed Unit, an infinitely variable transmission, this boring machine offers both fine and coarse feeds ranging from .004″ to 1.000″ per spindle revolution. Main drive to the boring bar is obtained through a six-speed gear box, motor driven. Gears of high-carbon steel, mounted on spline shafts with anti-friction bearings running in oil. Power Rapid Traverse to bar in both directions. *Write TODAY for descriptive bulletin.*

ALSO Available Without Center-Section of Bed

SIMMONS MACHINE TOOL CORP., 1759 NORTH BROADWAY, ALBANY, N. Y.

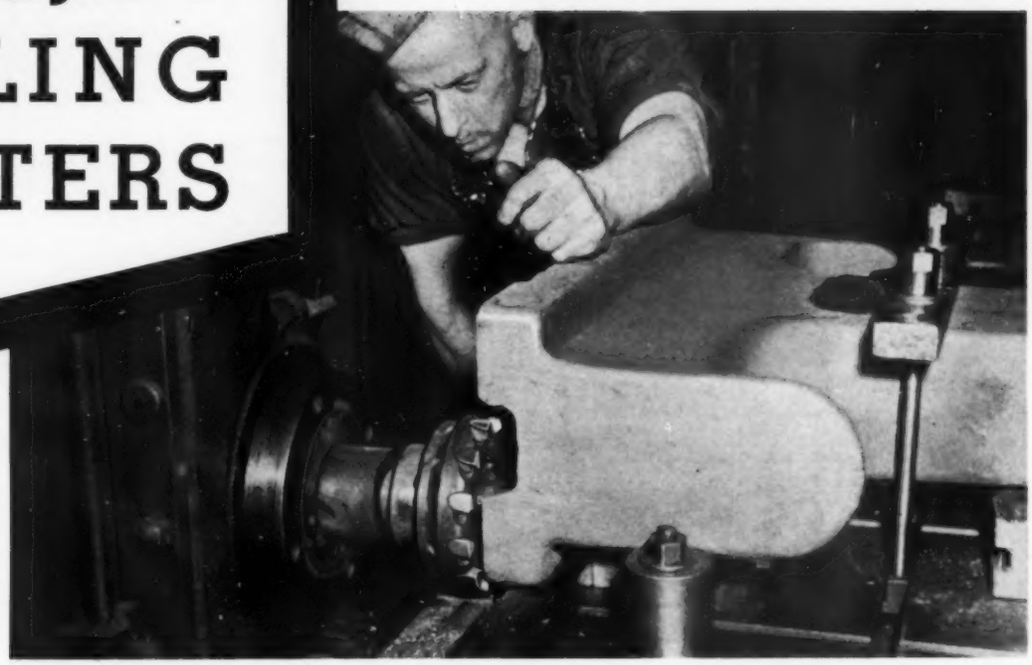
SIMMONS

MICRO-SPEED

REG. U.S. PAT. OFF.

LATHES · TURRET LATHES · MILLERS · BORING MACHINES

LOVEJOY MILLING CUTTERS



THEY GIVE AN EXTRA MARGIN OF PRODUCTION TO BOTH OLD AND NEW MILLING MACHINES

Rugged Lovejoy Milling Cutters are taking 24-hour production schedules in their stride. They are giving maximum results on all types and ages of milling machines.

They are also reducing down-time with the positive-locking feature obtainable only in Lovejoy Mills. Not only are the blades interchangeable, but they are easily removed, quickly sharpened, and readily replaced. You can get more work out of every blade, because they require less grinding to resharpen. This is another reason why Lovejoy Mills soon pay for themselves.

Reduce costs and down-time — increase production with Lovejoy Positive-Locking Milling Cutters.

MAIL THE COUPON TODAY

Please mail me the 24-page Lovejoy catalog covering the full line of Lovejoy Mills.

NAME.....TITLE.....

COMPANY .....

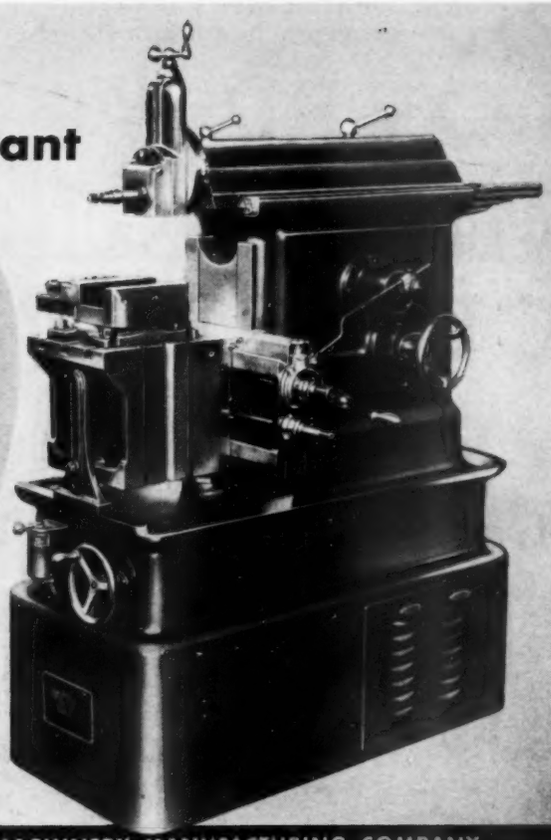
STREET .....

CITY.....STATE.....

A.M.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U. S. A.

If it's PUNCH you want get a VERNON 12" SHAPER!



Powerful operation of the Vernon 12" Shaper results from many carefully engineered features. For example—BACK-GEARING provides "push" for extra heavy cuts. HELICAL-CUT GEARS drive ram smoothly without shock or chatter because gear teeth s-l-i-d-e in and out of mesh. And you're sure of long, trouble-free life too...the Vernon is ball bearing and Timken tapered roller equipped throughout.

See this Vernon—you can still get prompt deliveries!

Bulletins are available featuring the Vernon Vertical Mill & Jig Borer, Vernon No. 0 Mill, Vernon 11" Shaper and Vernon 12" Shaper. WRITE TODAY!

MACHINERY MANUFACTURING COMPANY
1815 EAST 51 ST. VERNON LOS ANGELES CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

WANTED—A SALES MANAGER

By A Leading Detroit Machine-Tool Builder

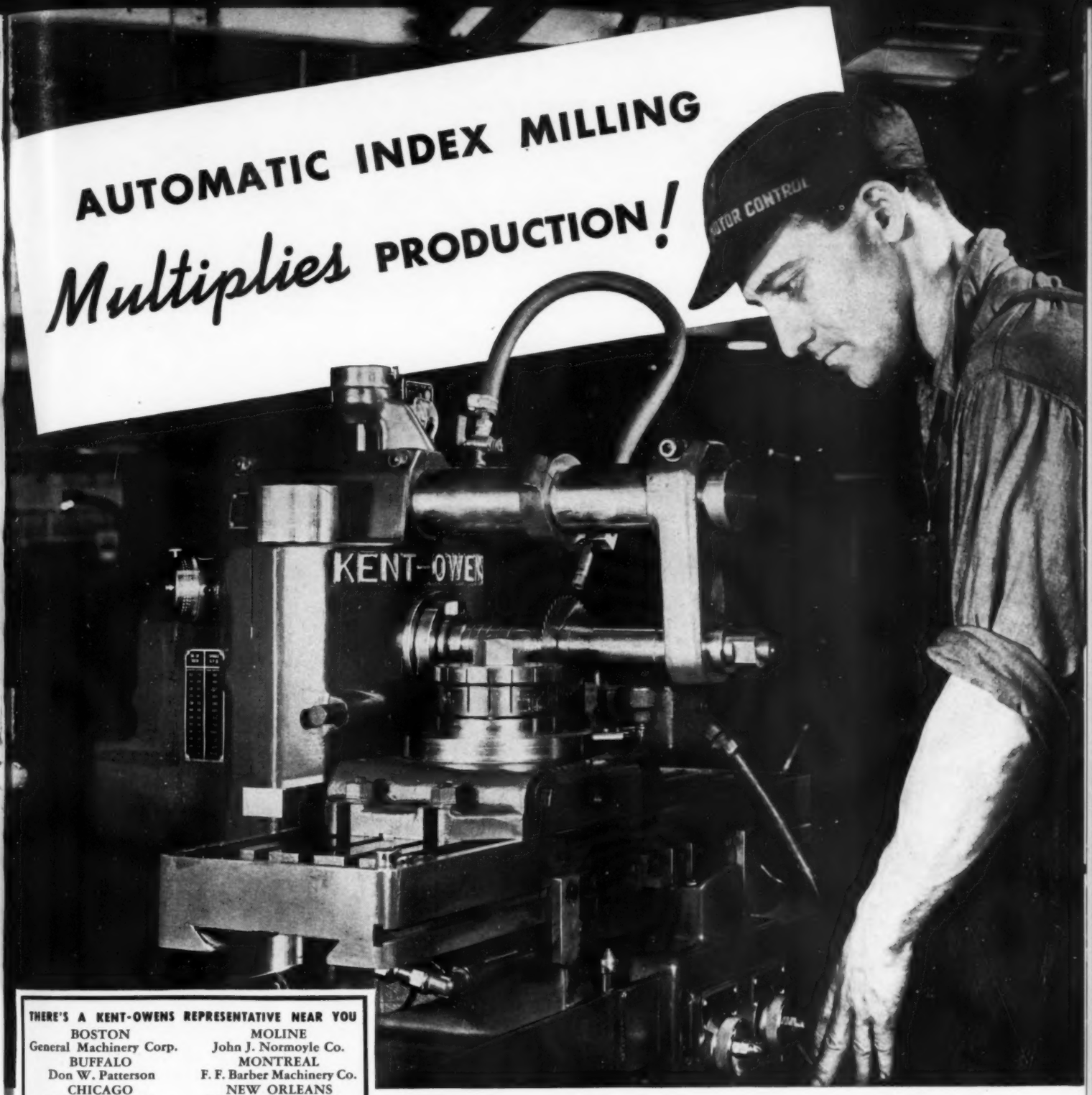
A permanent executive position—not a war job—with a medium-sized company, 45 years in the business. This company has earned a reputation for quality and world-wide recognition as a leader in its field.

Here are the requirements: Engineering knowledge and sound business judgment, plus experience and proven ability in the sale of specialized machine tools. The man for this important post has spent years in the development of a broad acquaintance in the machine-tool industry where he is well liked and respected. He is between 35 and 45 years of age, physically equipped to undertake the responsibility of directing an aggressive sales department consisting of an office staff and a group of salaried sales engineers in the field. He has a thorough knowledge of machining operations and methods, understands the application of standard and special machine tools, and possesses the personality to inspire confidence and develop business under a policy devoid of high-pressure sales methods.

If you have the training, experience and ability required for this position of leadership, write fully—giving complete personal data, including all positions held. State salary required. Your application will be regarded as confidential and none of your references will be contacted without your later approval. If your qualifications are satisfactory, an appointment will be made for a personal interview.

Address Box No. 286, In Care of This Paper

AUTOMATIC INDEX MILLING *Multiplies* PRODUCTION!



THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

DALLAS
Hamilton-Huster Machinery Co.

DAYTON
Gosiger Machinery Co.

DETROIT
A. C. Haberkorn Machinery Co.

GRAND RAPIDS
Joseph Monahan

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Oatis-Booth Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Eccles & Davies Machinery Company
Harron, Richard, & McCone

MILWAUKEE
Neff, Kohlbusch & Bissell

MOLINE
John J. Normoyle Co.

MONTREAL
F. F. Barber Machinery Co.

NEW ORLEANS
Oliver H. Van Horn Co., Inc.

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Wilson Brown Company

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Calco Machinery Company

PITTSBURGH
Barney Machinery Co.

ROCHESTER
F. W. Schiefer Machinery Company

SAN FRANCISCO
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SYRACUSE
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TORONTO
F. F. Barber Machinery Co.

WALKERVILLE
F. F. Barber Machinery Co.

● Shop men everywhere are calling on Kent-Owens for Automatic Index Milling Equipment.

Kent-Owens has had wide experience in engineering a great variety of fixtures for this type of work.

If you have operations that lend themselves to automatic index milling, contact Kent-Owens to *multiply your production.*

Kent-Owens Machine Company, Toledo, Ohio.

Call on KENT-OWENS *for Milling Machines*

FITCHBURG MILLING MACHINES

are specially developed for HIGH PRODUCTION WORK

The machine shown here—a PRODUCTION TYPE DUPLEX MILLER—was individually engineered by Fitchburg for milling the top, bottom and bearing cap seats on a Diesel engine cylinder block. It is typical of all Fitchburg machines which are specially designed for specific milling operations. Their ruggedness gives them great rigidity to achieve the maximum in production.

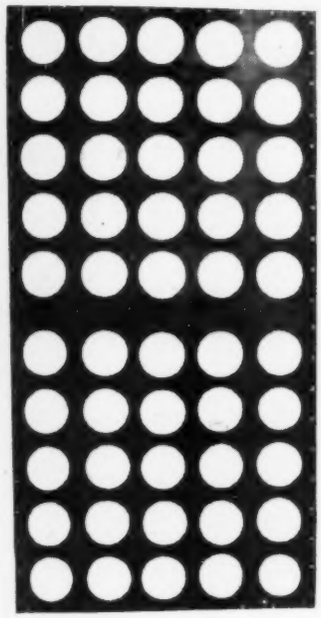
As specialists in production milling, Fitchburg can be of valuable assistance to you on your war production problems.

FITCHBURG ENGINEERING CORPORATION

FITCHBURG, MASSACHUSETTS

Above: Multi-punching a series of bolt holes at one time.

Right: Bending flanges. The same machine punches large holes in plate shown at left.



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PUNCHES 5" to 8" HOLES 25 TIMES FASTER!

Steelweld Bending Presses are versatile tools that can be adapted to many kinds of work by simply changing the dies. The same press that bends and forms plate can be set up to punch holes in a few minutes.

One Steelweld Press at the Dracco Corporation, Cleveland, does most of the metal work required in building Dracco dust collectors. It punches 5" to 8" holes singly in 12-gauge and 10-gauge plate, 25 times faster than formerly. It multi-punches 25 or more bolt holes at a time. It bends flanges and performs other forming operations.

This machine has been in continuous operation for more than 5 years without one cent of expense for repairs. It has been a big factor in stepping up production and reducing manufacturing costs at Dracco.

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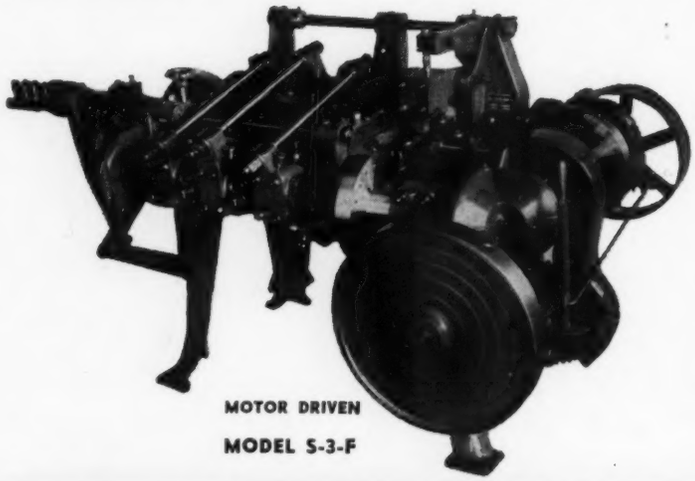

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Maybe this press or other W-S Presses like or unlike it can solve some of your problems. Bulletin 110-A, a condensed catalog, will answer that question. Secure it now.

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Pick 'em right

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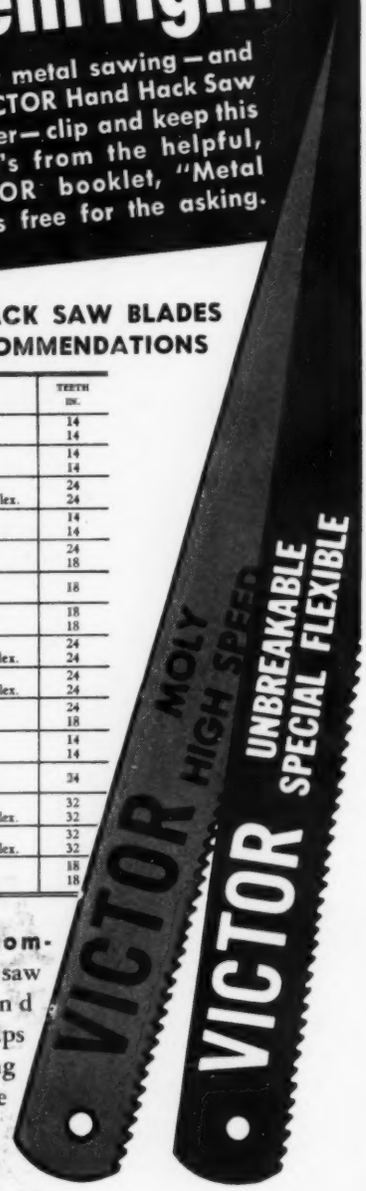
MATERIAL	TYPE BLADE	TEETH IN.
Aluminum	"Moly" All Hard	14 14
Brass	"Moly" All Hard	14 14
Conduit	"Moly" Flex. or Spec. Flex.	24 24
Copper	"Moly" All Hard	14 14
Drill Rod	"Moly" All Hard	24 18
Hard Alloys	"Moly"	18
Light Angles	"Moly" All Hard	18 18
Metal Trim	"Moly" Flex. or Spec. Flex.	24 24
Pipe Tubing	"Moly" Flex. or Spec. Flex.	24 24
Sheet Metals	"Moly" All Hard	24 18
Soft Steel	"Moly" All Hard	14 14
Steel Pipe	"Moly"	24
Thin Tubing	"Moly" Flex. or Spec. Flex.	32 32
Thin Wall Metals	"Moly" Flex. or Spec. Flex.	32 32
Tool Steel	"Moly" All Hard	18 18



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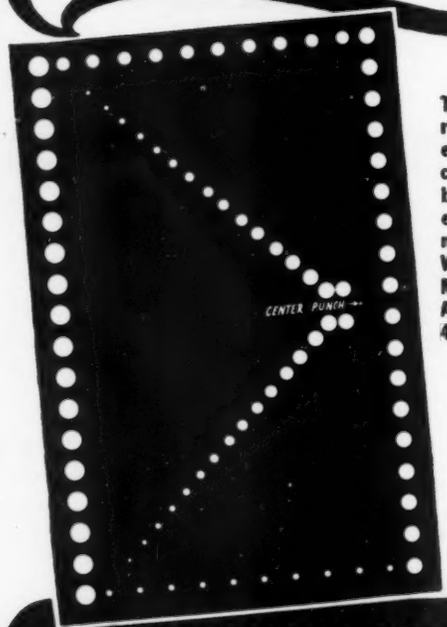
A MASTER TEMPLATE ACCURATE TO ±.002" IN 41 MINUTES!



Template 19" x 36" requiring 17 different round dies and center punch made by a leading radio-electronic equipment manufacturer on Wiedemann Type R-43 Micro Turret Punch. A total of 89 holes in 41 minutes.

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Only with a Wiedemann Micro Turret Punch Press will you get such speed—such accuracy—and such ease of operation. No preliminary layout; every hole is clean, accurate to ± .002"; equipped with center punch for accurately locating extremely small or very large holes.

This is but one example of what the Wiedemann Micro Turret Punch can do to produce accurate templates as well as extremely accurate short run piercing jobs so often required.

No need to tie up your tool room for 8 to 10 hours on a job like this. Write today for the facts about Wiedemann Turret Punch Presses—from 8 to 80 tons capacity.

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Type R-43 Micro Turret Punch—one of a complete line of production equipment for low cost, small run piercing operations. The method and results are superior.

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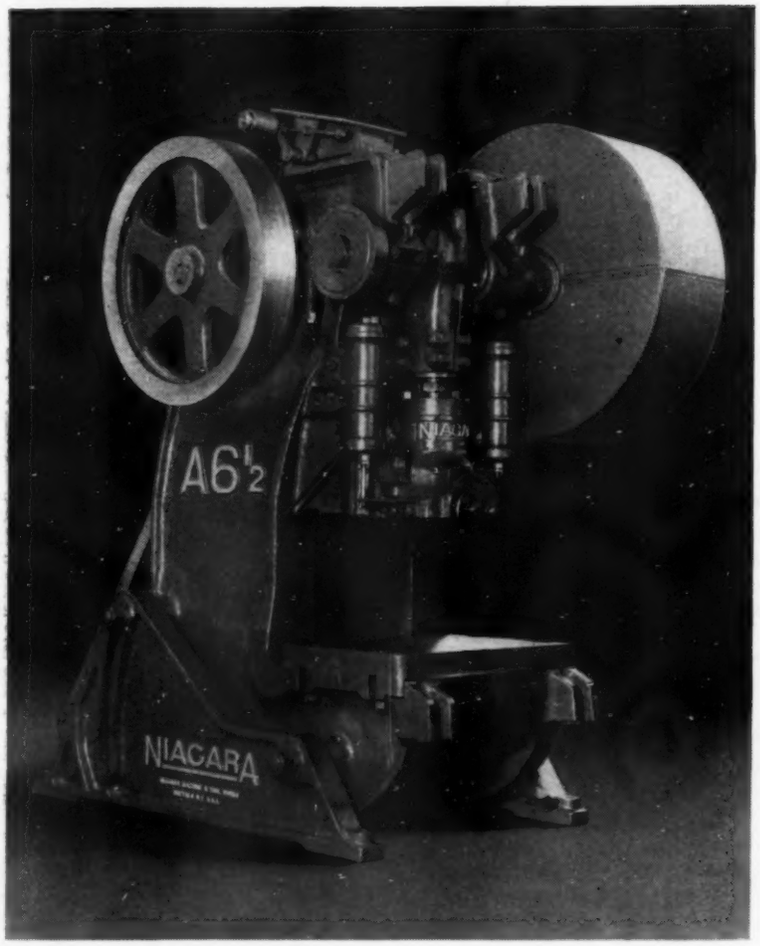

Manufacturers of America's warplanes are using Niagara machines for shearing and forming sheet metal.

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High production, convenient handling of the work, rugged construction that reduces down time are results of the talent and experience built into Niagara machines.

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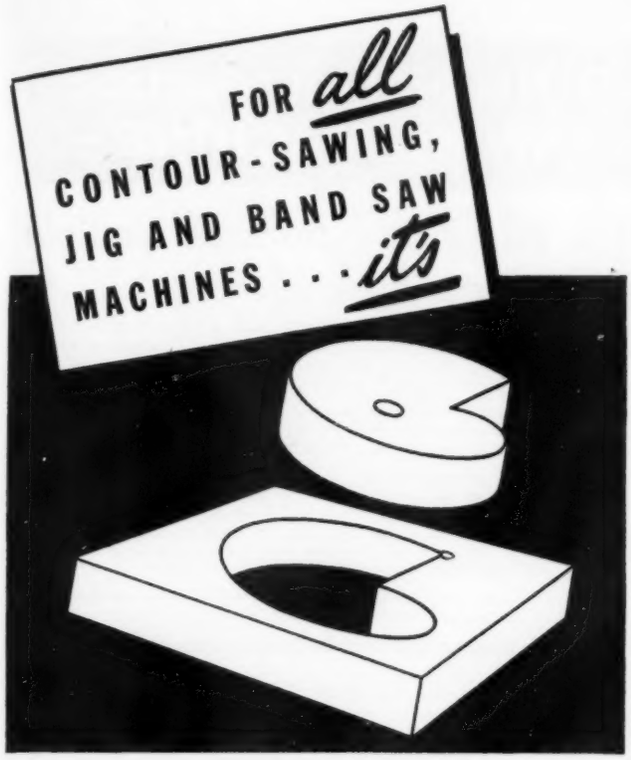

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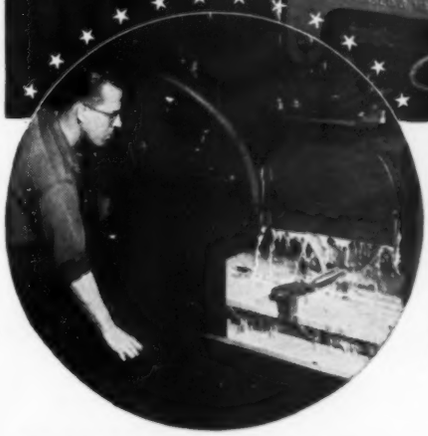

▲ *(Above)* **CAMPBELL #250 NIBBLING MACHINE** in high speed aircraft production in a plant in the Middle West. Note 2-hand grip of operator for perfect control.

◀ **CAMPBELL #302 ABRASIVE CUTTING MACHINE** working on hardened slab stock for high speed war production.

CAMPBELL CUTTING MACHINES

help Aircraft men set new production records

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The **CAMPBELL 302 ABRASIVE CUTTING MACHINE** illustrated is used to cut everything from dead soft annealed to hardened alloys—*at production speed.* One fast, accurate cut—free from burns and checks—replaces cutting methods that required several operations.

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Here at last **is an OUTSTANDING high-production COLD METAL SAWING MACHINE—**

Cuts stock from 3 inches up—Handles multiple cutting of small bars or shapes . . . . . .

The outstanding high capacity and speed of this new 8" Porter-McLeod machine—for general work or for production work in single or multiple units—are attained through modern, unique features of design which assure faster, cleaner, more accurate cutting.

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Standard feed is 3 inches per minute. This, however, can be stepped up for cutting such materials as brass or other non-ferrous metals.

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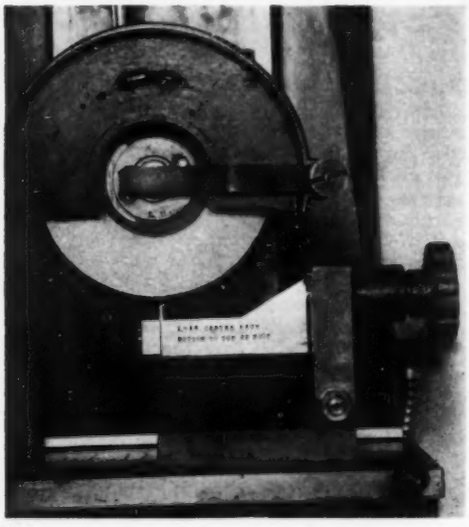

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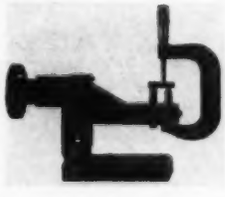
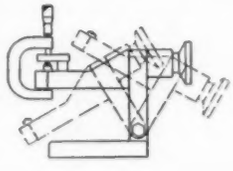


Vee Ground in Center of Arm

.013 Male and Female Radius

.500 Male and Female Radius



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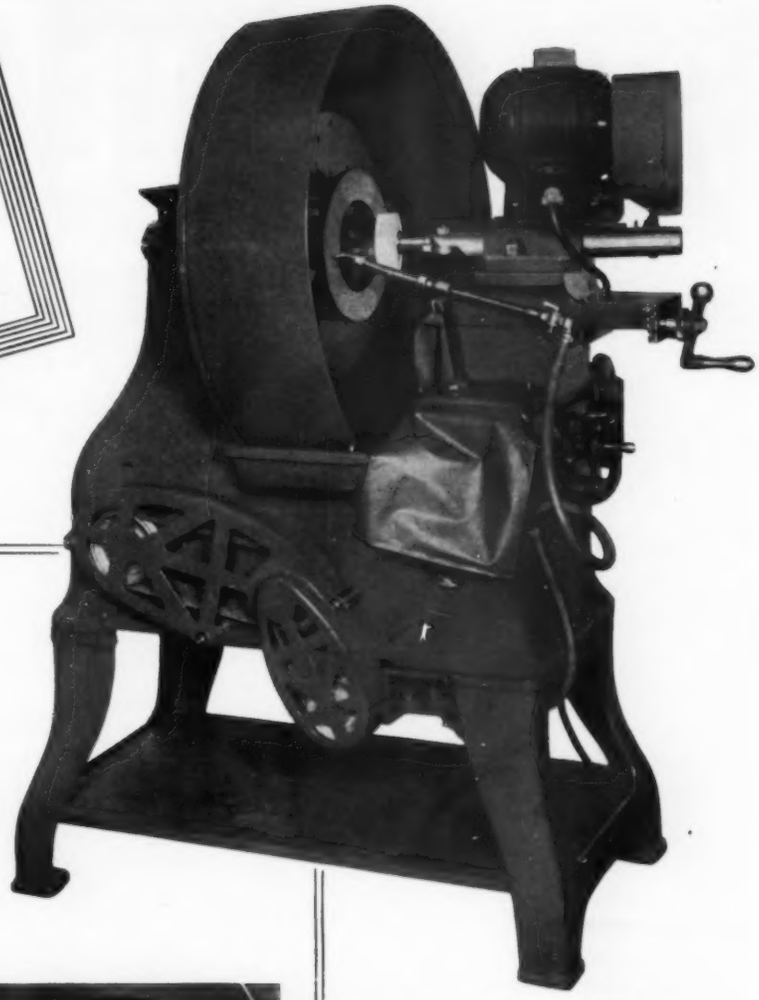

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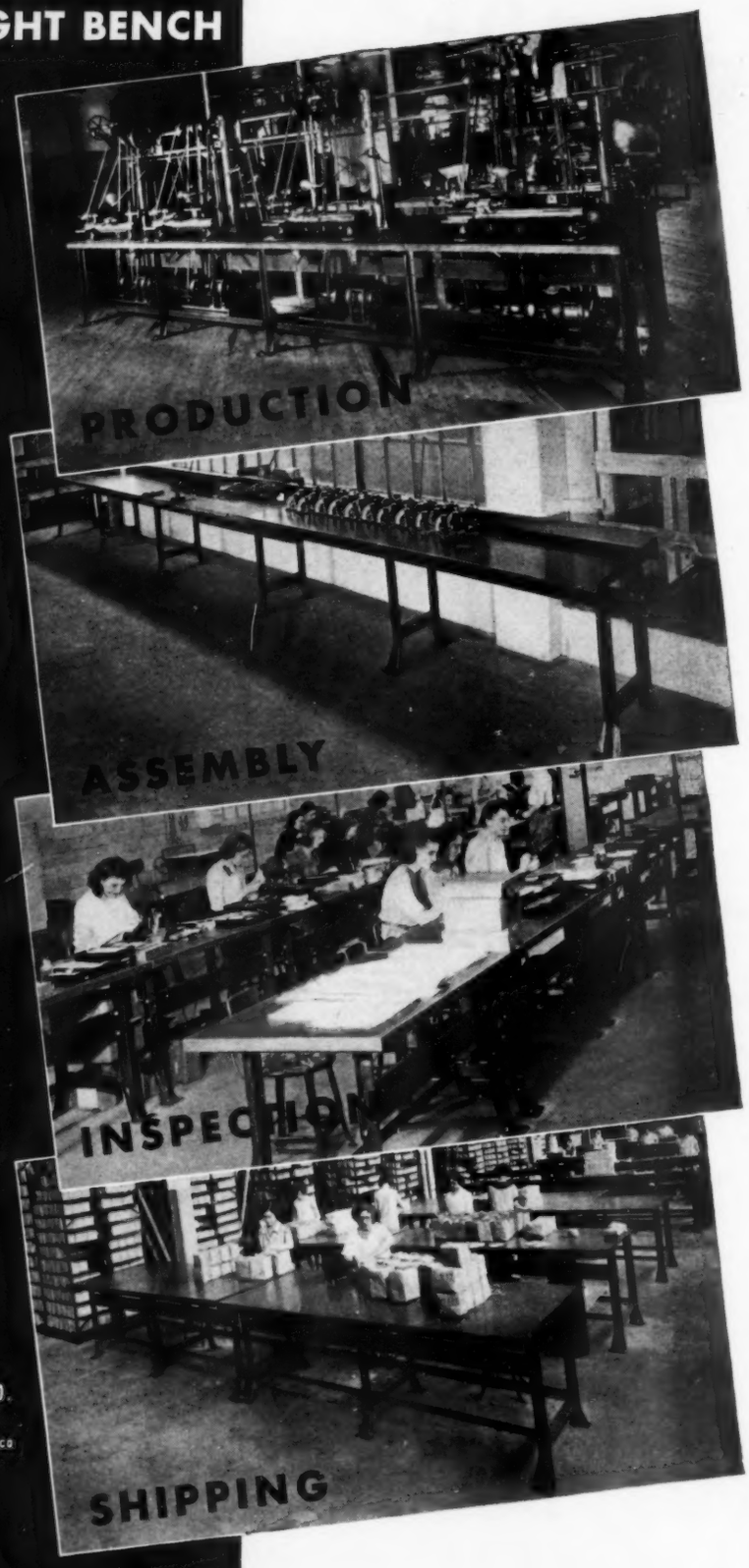

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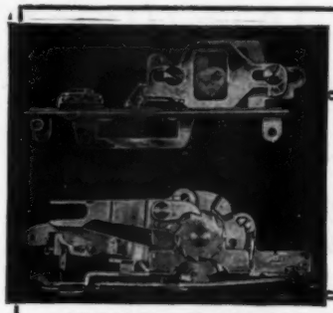

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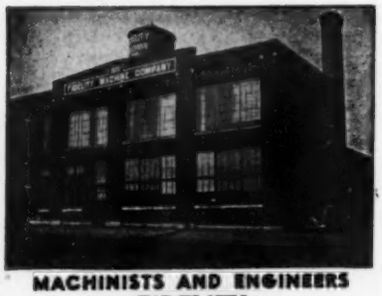
P. O. Box 265

Alexandria Virginia



MACHINISTS AND ENGINEERS

FIDELITY

MACHINE COMPANY

3906-18 Frankford Ave. Phila., Pa.

Jefferson 7600-1-2

FORGINGS

• All types up to 6,000 lbs. Smooth Forged—Finished—Rough Turned, Hollow Bored and Heat Treated to Specifications. Crank Shafts—Shafting—Connecting Rods

BAY CITY FORGE CO.

ERIE PENNSYLVANIA

PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small

MATCH PLATE WORK A SPECIALTY

Put your pattern problems up to us—we will take care of them—ask the foundries about our work —they use our patterns every day.

GENERAL PATTERN WORKS

2233 Buck Street Cincinnati, Ohio

Can You Build Machinery?

A prominent manufacturer of large machinery is in a position to subcontract units weighing from 5 to 10, or 20 tons. If you have accurate turning equipment (14-24"), planing equipment (48" or larger), horizontal boring machines, plain cylindrical grinders, etc., etc. as well as experienced fitting and assembling gang, communicate with Box No. 285.

WIRE AND METAL SPECIALTIES

In round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY

Plating and finishing

EASTERN TOOL & MFG. CO.

BLOOMFIELD, N. J.

What Makes a Mailing Click?

Advertising men agree . . . the list is more than half the story. McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Investigate today.

McGraw-Hill Publishing Co., Inc.

DIRECT MAIL DIVISION

330 West 42nd St., New York, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.
(See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time salaried employment only), ½ above rates.
PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns — 30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., July 27th will appear in the issue of August 6th, subject to limitations of space available.

WANTED

Experienced man to take full charge of a Tool, Cutter and Gage Shop.

P-282, American Machinist
330 W. 42 St., New York City

WANTED
GEAR SPECIALIST

possessing thorough knowledge of gear theory as well as shop practices pertaining to manufacture of hardened ground, high quality gears.
Apply by letter to Personnel Administrator, Inspection Department, Pratt & Whitney Aircraft, East Hartford, Connecticut.

To EMPLOYERS who advertise for MEN:

WHEN there are many applicants for a single position it frequently happens that the only letters acknowledged are those of the most promising candidates. Others may not receive any indication that their letters have even been received by a prospective employer much less given consideration. These men often become discouraged, will not respond to future advertisements, and sometimes question their bona fide character.

Every advertisement printed in the Searchlight Section is duly authorized.

It will help to keep our readers interested in this advertising if you will acknowledge every application received, even if you merely return the letters of unsuccessful applicants with, "Position filled, thank you" written or stamped on them. If you don't care to reveal your identity, mail them in plain envelopes.

We suggest this in a spirit of cooperation between employers and the men replying to Positions Vacant advertisements.

★

Departmental Staff

McGraw-Hill Publishing Co., Inc.

WANTED
MACHINE TOOL DESIGNER

One of the finest equipped plants in the Metropolitan District requires a machine tool designer of the highest type; one who has proven ability in creative work and initiative. This is a rare opportunity for the right man. No letter considered that does not give complete details of background. Starting salary $10,000.

P-240, American Machinist
330 W. 42nd St., New York, N. Y.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

WANTED SUPERINTENDENT. Thoroughly familiar with turret lathes, milling and drilling, medium size equipment. Defense work with excellent post war prospects with old established company for capable man. Write stating age, experience and qualifications. Reply P-270, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

TOOL DESIGNERS—Routers—Production Control Men. Must have machine shop background and complete knowledge of modern machine tools. Experience on medium-heavy machinery valuable. P-287, American Machinist, 330 W. 42nd St., New York, N. Y.

PRACTICAL TOOL ROOM FOREMAN. Permanent connection with long established Newark Area concern, now engaged in defense work, is offered to qualified man; must be fully conversant with operation of Modern Tool Room, capable to lay out and supervise work; write full particulars first letter, including past connections and salaries. P-288, American Machinist, 330 W. 42nd St., New York, N. .

WANTED: Engineer or Former Plant Superintendent, experienced in operation and maintenance of hydraulic presses, pumps and accumulators. State experience, age and salary desired. Information will be held strictly confidential. P-289, American Machinist, 330 W. 42nd St., New York, N. Y.

TOOLMAKER—working foreman screw machine tools and gauges. Extra pay for keyman. Liberal overtime. Cresco Corp., 4401 21st St., Long Island City, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $2,500 to $25,000. This advertising service of 32 years recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc. 266 Delward Bldg., Buffalo, N. Y.

WANTED

WANT TO BORROW for 3 months: 2-B & S #2 or 2A. Universal Millers and 2-B & S #2 or 2A Plain Millers with vertical heads. Will pay liberal rentals. Machines must be new or equivalent. Ernst A. Mentor, 240 East 79 St., New York.

POSITIONS WANTED

FACTORY MANAGER or Superintendent, Technical Graduate, 22 years experience supervising production, development and design, progressive manufacturing and assembly of medium and small parts, tool and process engineer, desires connection of responsibility. PW-281, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS—Booklet free. Highest references. Best results. Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

PATENT ATTORNEY, CONSULTING ENG'R. Over twenty years engineering experience with patents. Confidential. Personal Service. David Manly Heller, 134 North LaSalle, Chicago.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on the page Facing the inside back cover.

ALFRED HERBERT LTD.
COVENTRY, ENGLAND

OFFICES AND SHOWROOMS AT — LONDON, COVENTRY, GLASGOW, MANCHESTER, BIRMINGHAM, SHEFFIELD, BRISTOL, NEWCASTLE, CALCUTTA, BOMBAY, SYDNEY, MELBOURNE, BUENOS AIRES

representing a number of leading United States makers of machine tools and workshop equipment can undertake additional agencies.

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

PROFESSIONAL SERVICES

MORRIS AND VAN WORMER
Est. 1924
Production Engineers
WAR PRODUCTION
METHODS — DESIGN — QUALITY
PLANT LAYOUT — CONVERSION
25 Broad Street New York City

Equipment Wanted Advertising—Page 160

EASTERN OFFERS

BORING MILLS

30" Colburn, 1 head
48" Niles-Bement-Pond Car Wheel Borer, m.d., facing attach.
48" Niles-Bement-Pond Car Wheel Borer, belt

BROACHING MACHINES

Cincinnati Mill Broach, m.d., new
No. 2 LaPointe of Hudson
No. 2 J. N. LaPointe, m.d. thru gear box (2)
No. 3 J. N. LaPointe Double, belt (5)

PLANERS

30"x30"x8' Cincinnati, belt, 1 head

PRESSES

D2 Ferracute S.A. Drawing
F2 Ferracute Stiles
No. 6 Waterbury-Farrel D.C.
S51 Ferracute D.C.
No. 268¼B Toledo D.C. Toggle Drawing, 29" stroke, weight 175,000 lbs.
No. 496D Toledo D.C. Toggle Drawing, 17" stroke, weight 160,000 lbs.
No. 0 Springfield Bench Type Straightening
Metalwood Hydro-Pneumatic type B45
Metalwood Hydro-Pneumatic type B33
300 ton Caldwell Hydraulic Wheel Press
30 ton Lourie type BX

MISCELLANEOUS

17x21" Lentz Steam Engine, direct connected to 200 KVA Allis-Chalmers, 240 volts A.C. Gen.
Gisholt Precision Balancing Machine, m.d.
Norton Running Balance Indicating Machine, m.d.
No. 5 Williams & White Bulldozer, belt
250 H.P. Sprague Electric Co. Electric Dynanomotor Laboratory Test
No. 22 Williams & White Eye Bender, m. d.
No. 2 Cochran-Bly Filing Machine, belt
No 1 Fischer Oil Groover, belt
No. 1 Fischer Oil Groover, m.d.
Production Polishing Machine, belt
Blevney Polishing Machine, belt
Wagner Saw Sharpener, belt
No. 11 Cochran-Bly Saw Sharpener, m.d.
No. 11S Cochran-Bly Saw Sharpener, m.d.
No. 1 Leighton Type Straightening Machine, m.d., new (2)
¼", ⅜" Shuster Wire Straighteners

SHEET METAL MACHINERY

10' Bertsch Power Squaring Shear, 3/16" cap., m.d.
No. 25S 2x14 Quickwork Rotary Shear, m.d., ¼" cap.
No. 34 Lennox Rotary Bevel Shear, cap. ¾"
Niagara Circle Shear, 16 ga.
Southwark Rotary Metal Cutter, s.p.d., cap. ⅜"
8' Niagara 18 ga. Foot Power Shear
7' Hand Brake, 18 ga.
McCabe Pneumatic Flanger, ⅛" cap.
Niles-Bement-Pond 8' Hand Flanger
Niles-Bement-Pond 10' Hand Flanger
No. 1 Campbell Nibbler, 3/16" cap.
No. 2 Campbell Nibbler, ⅜" cap.
No. 4E Universal Trimmer
Magee Sheet Metal Wiring & Edging Machine
No. 10A Quickwork Double Seamer
8' Robinson Power Brake, 10 ga.

SLOTTERS

18" Niles Slotter
84" Newton Slotter

HAMMERS

60 lb. Bradley Rubber Cushioned Helve
80 lb. Bradley Rubber Cushioned Helve
100 lb. Little Giant
800 lb. Bement Steam
1000 lb. Bement Steam
1100 lb. Bement Steam
1100 lb. Niles-Bement Steam
2000 lb. Niles-Bement Steam
2500 lb. B Bement Steam
Pettengell Bumping, belt

GEAR CUTTERS & HOBBERS

16" Gould & Eberhardt
18" Gleason Straight Tooth Bevel Generator
No. 1-26" Whiton Full Universal
Gleason Spiral Bevel Gear Rougher
30" Brainerd
No. 3-26", 3-36", 3 Heavy, 4-36", 4-48", 6-60", 6-72" Brown & Sharpe Automatic Gear Cutters
No. 3-26" Cincinnati Gear Cutter
Cross Gear Tooth Rounder, belt

Partial Listing only.
Send us your inquiries.

The
EASTERN
MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

USED MACHINE TOOLS
GUARANTEED BY
A TIME TESTED, RELIABLE COMPANY

BROACHES

No. 4 J. N. LaPointe

DRILLS

1 spdl. Henry & Wright
1 spdl. Leland-Gifford
2 spdl. Leland-Gifford Bench
2 spdl. Henry & Wright
4 spdl. Henry & Wright
4 spdl. Sigourney
4 spdl. Woodward & Rogers
6 spdl. Henry & Wright
2 spdl. Baker Cylinder Borer

GEAR CUTTERS

No. 4—48" Brown & Sharpe

GRINDERS

(See page 157—special advertisement Hill-Clarke Cylindrical Grinders)
22"x96" Norton Plain, M.D.
No. 40 Bryant Plain, Wide Wheel, Oscillating
No. 10 Lees-Bradner Spur Gear Grinder
No. 5 Springfield Planer Type Surface
No. 18 Bryant Internal
No. 60 Heald Cylinder
1½" dia. New Yankee Drill Grinder

LATHES

3½"x60" Fitchburg Lo-Swing
No. 4 AC Leblond Auto. Duplex Crankshaft
26"x10' Bridgeford Plain Turning

SLOTTERS

10" Newton

MISCELLANEOUS

60" Quickwork Rotary Shear
6" Saunders Pipe Machine
No. 12 Bignall & Keeler Pipe Machine
No. 4 Gaterman Tapper

HILL-CLARKE MACHINERY CO.
651 W. WASHINGTON BLVD. CHICAGO

GRINDERS

20"x144" Landis, plain, cylindrical; motorized.
12"x36" Pratt & Whitney, surface; belt drive.
18" Gorton double end Disc, belt drive

BUFFERS

6—6 HP Van Dorn Buffers, 220/3/60 motor 72x1¼ spindle

THE O'BRIEN MACHINERY CO.
OFFICE: 113 NORTH THIRD STREET
PHILADELPHIA, PA.

AUTOMATIC, 1¼" Cleveland Model B #34 New Britain Chucker
GRINDERS, #2 Churchill Internal, can grind 30" deep, dist. center of spin. to top of table 18"; 30" x 240" Landis Cyl.; 24" x 96" Landis Cyl.; 20" x 96" Landis Cyl.; 10" x 24" Norton Cyl. M.D.; No. 25A Heald, 30" Rotary Surface, M.D.; #3 Cinci. Centerless, M.D.
GEAR CUTTERS—60" x 12" Gould & Eberhardt, Spur; 11" Gleason Bevel Gear Generators (2). 36" G & E Spur and Bevel. 8" Hercules Hobber.
KEYSEATERS—#3 Baker, 26" stroke x 3" wide; #6 Catlin 40" stroke x 5" wide; #4 Mitts & M., 19" stroke x 2½" wide; #1 Davis.
MILLING MACHINES—#3 Lees Bradner Thread Miller; Model D Hall Planetary Thread Millers; #6 Jackson Die Sinker or Vertical Miller. #4 Cinci. Vert. M.D.
PLANERS—60" x 48" x 14' Bertram Openside, 3 hds., DC Reversing M.D.; 26" x 8' Gray, 1 head.

ROSENKRANZ MACHINERY CO.
30 Church Street New York, N. Y.

96 INCH GLEASON
STRAIGHT BEVEL
GEAR PLANER

Motor Driven. With Standard Equipment and large Assortment of Cutting Tools

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
Indianapolis, Indiana

1—No. 6 Lees Bradner Thread Miller, M.D.
1—12" Cincinnati Production Mill, M.D.
1—No. 5 Toledo Punch Press, M.D.
2—No. 2X Hannifin Air Arbor Presses
1—No. 2 Garvin Duplex Mill, M.D.
2—No. 6A Potter & Johnston Turret Lathes, M.D.
1—Kingsbury 8 Head Multiple Drill, M.D.
1—Brinnel Tester
1—No. 2 Baxendale Punch Press, M.D.
1—No. 62 Bliss Punch Press, M.D.
1—Dings Magnetic Separator
1—No. 1-A Wm. Sellers Universal Tool Grinder

Your inquiries receive prompt attention

CENTRAL MACHINE TOOL CORPORATION
Adams 1914
122-126 Nebraska Ave. Toledo, Ohio

SLIDING-BED GAP LATHE

18"/36"x12' NEW HAVEN Quick Change, 3-step cone, DBG; takes 11'6" between centers with gap open; with 2 chucks, taper attachment, etc.

ALEX ZEEVE & COMPANY
2269 Woolworth Building New York, N. Y.

BEDFORD 42" x 42" x 14' OPEN SIDE PLANER

1 cross head, 1 side head.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N. Y.

FALK *for* DEPENDABILITY

SHAPERS & SLOTTERS

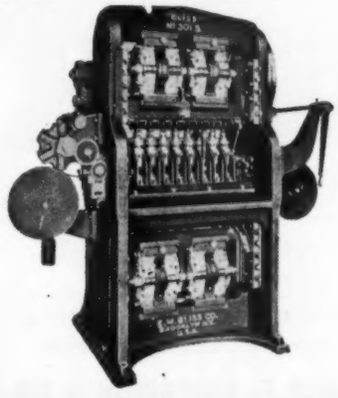
15" HENDEY, Friction Drive (5), $450 ea.
20" CINCINNATI, Geared Crank, complete.
24" Stockbridge, Geared, Crank, Heavy. Cone dr.
20"x20"x24" N-B-P SHAPER-PLANER, Motor Dr.
12" New Haven Slotter; 32" Rotary Table.
7" Rhodes combination Shaper and Slotter, belt dr.

DRILL PRESSES—HIGH SPEED, BALL BEARING; SLIDING HEAD; SCREW EL. TABLES

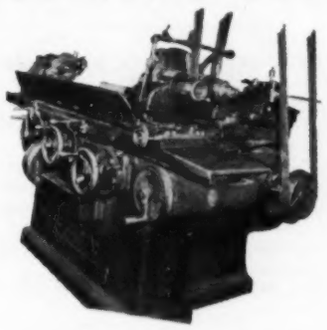
4-Spindle Foot-Burt High Speed Ball Bearing with power feed to each spindle; automatic quick return, tight and loose pulley drive; 8" overhand No. 2 Morse Taper; table working surf. 14"x48".
1-Spindle Avey No. 3, 12" Overhang, No. 3 M.T. with Power feed; Ball Bearing.
1-Spindle Avey No. 2, 8" Overhang, No. 2 M.T. with Power Feed; Ball Bearing.
2-Spindle Avey No. 2, 8" overhang, No. 2 M.T. Plain Hand Feed; Ball Bearing.
3-Spindle Avey No. 2, 8" Overhang, No. 2 M.T. Plain Hand Feed; Ball Bearing.
2-Spindle Leland Gifford No. 2 M.T. 10" Overhang, Power feed to one Spindle.
2-Spindle KERN No. 2 M.T. 8" Overhang.
2-Sp. Henry & Wright, 8" Overhang, No. 2 M.T.
1-Sp. EDLUND No. 2B, 8" Overhang, No. 2 M.T.
1-SPINDLE ALLEN No. 2 M.T. 8" Overhang.
1-Spindle FOSDICK with TAPPING MECHANISM On SPINDLE No. 2 M.T. 8" Overhang.

PUNCH PRESSES

No. 18, 18C, 19, 19C, 20B Bliss, O.B.I.
No. 19 Truesdale OBI.
No. 4 Adriance OBI.
No. 46 MICHIGAN OBI
No. 4 V & O—OBI.
No. 73½ BLISS S.S. Plain flywheel.
No. 4 Bliss Back Flywheel Geared.
No. 2 BLISS Back Flywheel Plain, (6).
No. 1—Bliss Back Flywheel Plain.
No. 3R—Marquette Geared, Motor Dr.
No. 15N BLISS, arr. Geared, Motor dr. (2).
No. 41 TOLEDO HORN PRESS, arr. Motor dr.
No 6 Waterbury Backed Geared, Open Back.
No. 25N BLISS Geared, Motor dr.; (3).
No. 1 BLISS S.S. Toggle Press.
25 Ton Henry & Wright High Speed Press, dble. roll feeds.
No. 103S BLISS GANG DIE PRESS; Roll Feed.
No. 4½ BLISS three column Forging Press with Taper Rolls.
6 Ton General Flexible Press.
12 Ton Fox Flexible Press.
400 lb. Chambersburg board Drop Hammer.
1500 lb. Chambersburg Steam Hammer, single leg.
50 lb. DuPont Blacksmith Hammer.
15 lb. Bradley upright Strap Hammer.
No. 30 BLISS ARCH PRESS, Plain.
No. 25 NIAGARA ARCH PRESS, Plain.
No. 71 Waterbury Coining Press 25 Tons.
No. 93D TOLEDO DBLE. CRANK GEARED S.S. PRESS, Welded Frame.
No. 75 Toledo Open Back Plain Flywheel Press.
No. 16 Bliss Horn Press, 3" stroke, Motor Driven.
No. 2 Niagara OBI; No. 0 V & O (3).
No. 3 American Can Co. OBI.
No. 53 Perkins Sprue Cutter.
No. 5 Middleditch Sprue Cutter.
No. 1—100 lb. Standard Automatic Drop Hammer.
No. 702—BLISS TRIMMING PRESSES (2) Flat.
No. 4 Waterbury open back, rigid bed, plain.
520 Ton Southwark Hydraulic with Laurie Pump.
SHERIDAN EMBOSSING PRESS, 24x36.
#7H Cleveland HORN PRESS back geared, 8" stroke with screw elevating cable. 42 tons.
#39B Bliss HORN PRESS.
#4 Bliss, double crank GEARED PRESS. 4" stroke, bed 32x28.



A LIST OF FALK DEPENDABLE MACHINERY



DISC GRINDERS

Gardner No. 8—40" disc, 30" Ring Wheel, B.B. Belt Dr.
Gardner No. 4—20" Disc., 16" Ring Wheel, B.B. Belt Dr.
Badger No. 2—16" Disc, Double End, Univ. Tables, Belt.
Gardner No. 1—double end Disc, 12", B.B. belt dr.
GARDNER No. 14, Ball Bearing, double opposed, 20" discs.

20"x120" Landis Plain Cylindrical Grinder Self Cont'd, Motor drive, Serial 8034.

GRINDERS—Cylindrical

20"x120" LANDIS Self-Contained, Motor dr.
12x36" CINCINNATI Plain, Arr. Motor Dr.

AUTOMATIC CHUCKING MACHINES

2—No. 24 New Britain type 5 spindle.
1—No. 23 New Britain type 5 spindle.
1—J&L, HARTNESS AUTOMATIC CHUCKING LATHE; motor driven, 6"x12".

BROACHING MACHINE

Cincinnati SURFACE BROACHING MACHINE, model #5-54 duplex. New in 1937.

PUNCH & SHEARS

WICKES COMBINATION PUNCH AND SHEAR; MOTOR DRIVEN; 1¼" thru 1" Plate; Punching end 48" throat; Shearing end 36" throat; Continuous 6"x1" Plate.
LONG & ALLSTATER No. 2—24" Throat, arr. motor dr. Capacity 1" thru 1".
Niagara 36" foot Shear, 16 ga.
Kutscheid all steel 36"x16 ga. Foot Shear.
Pexto 48"x16 ga. Foot Shear.
Pittsburgh 36"x¾" Plate Shear, no holddown.
UNITED ENGINEERING Plate Shear 42"x3/16 no holddown.
No. 216D NIAGARA RING AND CIRCLE SHEAR, Motor Dr.
No. 236 PEXTO CIRCLE SHEAR, SPD; 16 ga.
No. 132 BLISS 14 ga., 12" throat, Slitter.
No. 232 Bliss 12 ga., 18" throat, Slitter.
12'x¾" and 6'x¾" STAMCO MILL PACK SHEAR.
BLISS 24"x16 ga. POWER SHEAR—Perfect for Tin Plate.

COILING MACHINES

No. 1 and No. 2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ½" cap. Last used for Speedometer cable. Complete.

KEY SEATER

No. 3½ BAKER 72"x3" Cap. immediate delivery.

HAND SCREW MACHINE

#2 BARDONS & OLIVER, Geared Friction Head, Power feed to Turret, 1" Cap. fitted with complete automatic chuck and air cylinder.

INTERNAL GRINDER

GREENFIELD No. 12, HYDRAULIC FEED, Motor Drive; Cap. swings 15" Grinds automatically ¾" to 5" dia.; 4" Deep; New in 1928.

MILLING MACHINES

No. 1 Cleveland, Motor Drive—$1,750.00. Coolant Pump, Motor $95.00 Extra. cap. 18" longit. feed 16" Vertical travel 8½" cross travel table working surface 8"x32"

No. 12 Pratt & Whitney Lincoln Production Miller.
No. 2 Pratt & Whitney Lincoln Production Mill.
1—3-H LeBlond Plain Miller, au. motor drive. Power feed all direction.

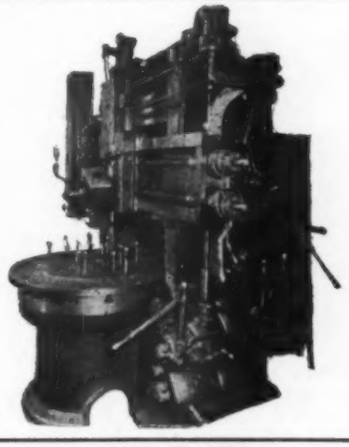
LATHES

42"x25' PUTNAM triple geared, 17'6" centers; Plain change gear, screw cutting.
36"x18' PRENTICE Lathe 9' Centers—Pl. chge. screw cutting, chuck and standard equipment.
22"x16' REED light Pattern, Pl. Change gear; 11" Centers, $750.
19x8 LEBLOND Production Turning Lathe
1—16"x8' American C.G. Lathe—au. M.D.
11"x4½' DAVIS pl. change screw cutting engine lathe; complete; $225.
10"x4' LOGAN (NEW) Lathes, Ball Bearing Spindle; ½" Collet capacity; arranged for motor drive; power cross feed; $225, f.o.b. factory; priority certificate required; shipment from stock.
7"x36" PRECISION BENCH LATHES — Hardinge, Sloan & Chase and others.
8"x108" FITCHBURG LO-SWING LATHE; SPD.
18"x12' HAMILTON pl. Change, Cone dr. chuck
11"x4' PRATT & WHITNEY TOOLMAKERS LATHE, Taper att.
16"x6' SOUTH BEND pl. Chge., Screw Cutting Engine Lathes (2).

TURRET LATHE

JONES & LAMSON 3x36 Double Spindle Very fine condition.

5" Bar BETTS Knee Type Horizontal Boring Mill, M.D.



COLD HEADERS
#22 Waterbury Farrell Cold Headers Dble stroke Solid Die also #11.

RADIAL DRILLS

DRESES 3' Arm. Plain Radial, Motorized; REBUILT —READY TO GO.
DRESES 4' Arm, Plain Radial, cone dr.

DIE CASTING MACHINES
3—MADISON-KIPP late model, 10"x12", 12"x14", 12"x16".

GEAR CUTTERS

No. 2 WHITON SPUR GEAR CUTTER, Auto.
36" Gould & Eberhart, "Victoria Model" perfect Cond.
48" Gould & EBERHART, Motor Driven; Complete; Perfect Cond.
No. 36B Gould & Eberhart Spur and Bevel Gear Cutter, Motor Dr.

HAMMOND 10 H.P. BUFFERS—8 months old. Motors in base, 3-60-220/440.

NEW LINES—WE SELL DREIS & KRUMP "CHICAGO" PRESS BRAKES AND BENDING BRAKES; STREINE POWER SQUARING SHEARS; BUFFALO DRILLS AND IRON WORKERS; CLEVELAND MILLING MACHINES; INDEX UNIVERSAL VERTICAL MILLERS; TROYKE ROTARY TABLES; L-W LATHE CHUCKS; INDEX HEADS; MAGNETIC CHUCKS AND HACK SAWS; VISES; OSWEGO MACHINISTS BENCH VISES; B-LINE MOTORS; VALLEY ELECTRIC GRINDERS; INQUIRIES INVITED.

FALK MACHINERY COMPANY

MACHINERY MERCHANTS

18 WARD ST., ROCHESTER, N.Y.

...IN STOCK

AUTOMATICS

No. 515 National Acme, four spindle
No. 52 National Acme, four spindle
No. 53 National Acme, four spindle
No. 55 National Acme, four spindle
1¼ Gridley Model G, four spindle
1¾" Gridley, four spindle
1¼" Cleveland Model A, single spindle
3" Cleveland Model A, single spindle

BROACHES

No. XB10 Oilgear Hydraulic Twin 15 Ton Hercules Vertical

DRILLS

4' Prentice Radial
No. 17 Foote Burt, 2 spindle
No. 1 Bausch, 8 spindle
Pratt & Whitney Gun Barrel, 2 spindle, m.d.

GEAR CUTTERS

No. 3 Gould & Eberhardt Automatic Gear Cutter
3 Spindle Gould & Eberhardt Gear Rougher
No. 6 Fellows Gear Shaper
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
18" Gleason Gear Tester
No. 5A Lees-Bradner Gear Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

No. 55 Heald Cylinder
No. 60 Heald Cylinder
No. 24—53" Gardner Disc

LATHES

17" x 8' Sidney, c.d.
18" x 6' Lodge & Shipley, c.d.
18" x 9' Chard, c.d.
17" x 8' Wickes Production, c.d.
3½" x 60' Fitchburg Lo-Swing, q.h.

TURRET LATHES

No. 2B Foster, q.h.
No. 6A Potter & Johnston, q.h.
No. 4 Warner & Swasey Universal, c.d.
No. 7 Bardons & Oliver, c.d.
2¼" x 11" Acme, c.d.
2¼ x 24 Jones & Lamson, q.h.
3 x 36 Jones & Lamson, q.h.

MILLS, PLAIN

No. 3 Cincinnati, c.d.
No. 8 S Becker, Duplex, c.d.

MISCELLANEOUS

No. 3E Lees-Bradner Thread Miller, Collet Type
⅜" x 6' Pyramid Type Roll
⅝" x 18' Nilson Wire Straightener
Wisaco Oil Groover
2" Pratt & Whitney Duplex Spline Mill

TAPPERS

No. 14V Rickert Shafer
No. 1 Garvin
½" Rickert Shafer Radial

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

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INDIANAPOLIS, INDIANA

Eastern Branch:
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MOREY
DEPENDABLE
USED MACHINES

ROCKFORD #2 Horiz. Boring Mill —floor type—M.D.
G. & E. 48" Gear Cutter
WHITON No. 15 Auto. Gear Cutter
INGLE 12" Gear Tooth Rounders
GLEASON 37" Bevel Gear Planer
GLEASON 10" Spiral Bevel Gear Generator
GLEASON 6"-11"-18" Bevel Gear Generators
LEES BRADNER #5A Gear Generator
LANDIS 3½" Internal Hydraulic Race Grinder
LANDIS 16"x36" Plain Cyl. Grinder—M.D.
NORTON 14"x50" Plain Grinder —M.D.
HEALD No. 60 Internal Grinder
NORTON 16"x50" Crankshaft Grinder—M.D.
GARDNER No. 6 Dble. End BB Disc Grinder
P. & W. 6"x132" Thread Miller
FELLOWS No. 4T Thread Generator
AUTOMATIC MACHINE CO. 12x4' Threading Lathe
BRIDGEFORD 27"x10' Boring Lathe
MONARCH 16"x10' Geared Head Lathe
FOOTE BURT No. 3 Rail Drill
P. & W. No. 12 Multi-Spindle Drill
NATCO C-13 Hyd. Multiple Spindle Drill
NATCO C-11C Multiple Spindle Drill
BLISS No. 31 Power Press
N.B.P. 400 ton Hyd. Wheel Press
ESPEN LUCAS No. 138 Cold Saw —Cap. 12" Rd.
NEWTON No. 197 & No. 200 Cold Saws
COCHRANE & BLY No. 5 Cold Saw
COULTER 2 spindle Diamond Borer—M.D.
LANDIS 4" Single Head Bolt Cutter
GRAY 30"x30"x8' Planer—2 heads on cross rail—M.D.
ACME 1" All Steel Upsetter
AJAX 3" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
KELLER E3 Auto. Profiler (Die Sinker)
ANDERSON Power Scraper
GISHOLT Precision Balancing Machine

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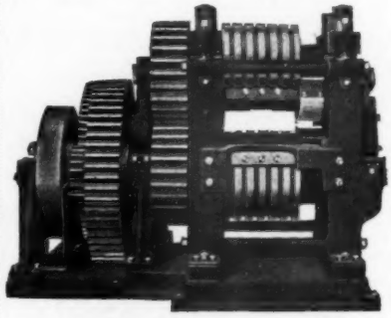

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1—No. 1A Ajax Taper
2—No. 1½A Ajax
1—No. 2 Ajax Taper

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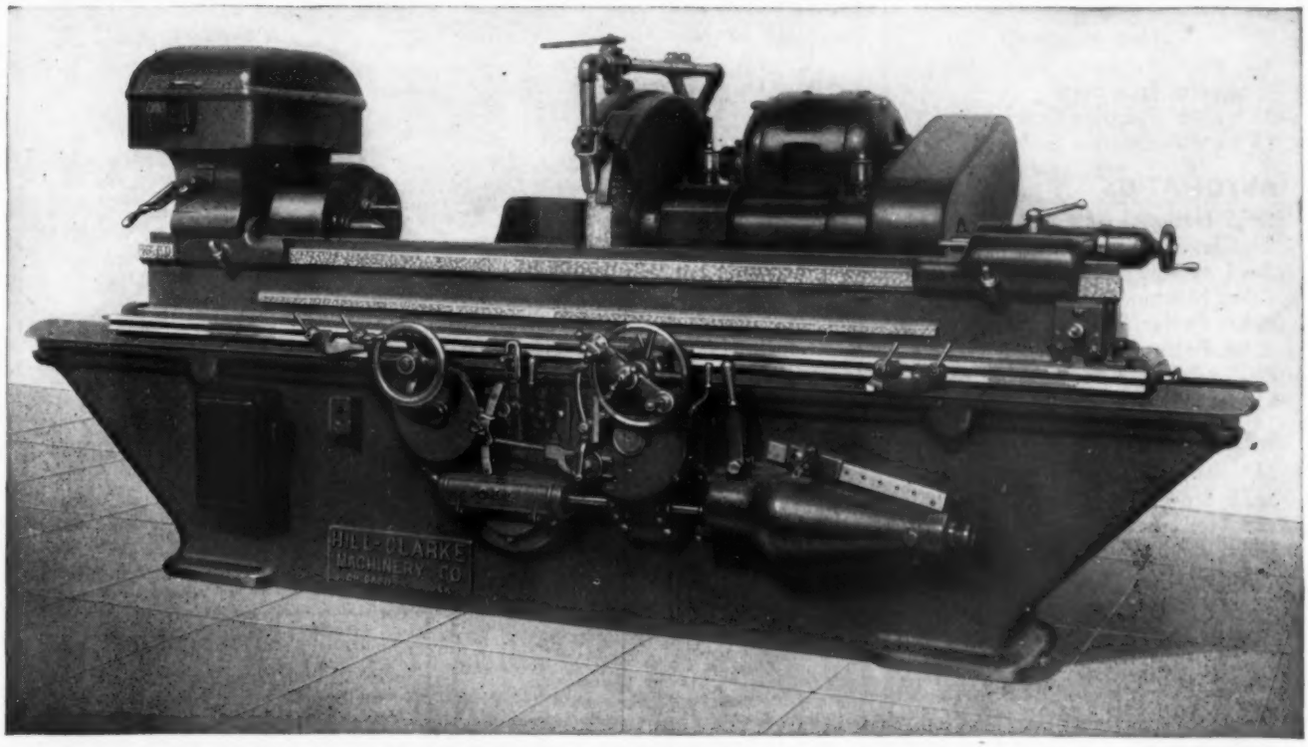

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14 x 50	14 x 72	16 x 50	16 x 72

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Immediate Delivery

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52" x 14' New Haven Q. C.
42" x 24' Putnam triple back geared, face plate
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18" x 10' Prentice G. H.

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#55 National Acme M.D.
2" Cleveland
2—4 spindle New Britain Chucking Machines
#5A Potter & Johnson
#6A Potter & Johnson
2¼" x 24" J. & L.
Model G ⅞" Capacity Gridley

GEAR CUTTERS

36" Fellow
#26 Brown & Sharpe
#3 Newark Spur
18" Gould & Eberhardt Spur & Bevel

RADIAL DRILLS

6' Prentice Gear Box, M.D.
3½" Prentice

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#4B Becker
#5B Becker
Becker #6
1—#4 Horizontal Brown & Sharpe

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14" Chase
16 and 20" Steptoe
24" Gould & Eberhardt

BORING MILLS

44" Rogers
36" Niles
30" Niles

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12 x 72 Brown & Sharpe
12 x 24 Cincinnati Universal

MISCELLANEOUS

Slotters

14"-16" Newton Vertical

Forming Rolls

Heavy Duty 5 Sets & 3 Sets

1—Chambersburg steam or air hammer 1000 lbs.
1—4 x 4½ Oaking punch & shear
1—40 lb. Bradley Hammer
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IN ALL THESE TYPES OF MACHINE TOOLS

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2 spindle Leland Gifford
4 spindle Woodward & Rogers
6 Spindle Allen
Baush Multiple
4—14" Drills
20" Barnes
21" Mechanics Drill
22" Sibley
24" Hoeffer
25" Snyder
28" Weigle

GRINDERS

2—#20 Bryant Internal
Norton double end
#4 Gardner Disc

LATHES

20x10' Perkins LCG
Fitchburg LoSwing
LeBlond Double End
Seneca Falls Lathe
16x6' Monarch Gap

MILLS

Garvin #2 Hand Mill
Porter #500 Vertical
#1 Bristol Hand Mill
Taft Peirce Thread Mill
#3 Burke Bench Mill
#6 Whitney Hand

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26x26x8' Ames
Yager Wood Planer

SAWS

2—30" Band Saws
5' Crescent swing saw
10" Circular saw
Toledo Hack saws (new)

SHAPERS

New 8" Shape Rite Shapers

MISCELAANEOUS

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10" Dill slotter
Hancock flame cutting machine
National Acme stud threader
3 ton portable crane
2 ton electric hoist
Waterbury Farrell DS8D Cold header with attachments
Waterbury Farrell bolt trimmer
Williams pipe cutting machine
#1 LaPointe Broach
2—8" Gleason gear generators
#00 Raymond Pulverizer

PRESSES

PG5 Ferrecute
#4 Bliss Punch
#94 Bliss Consolidated Punch
New Famco Arbor Presses
#101 Niagara Punch Press

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MACHINERY COMPANY

211 Jos Campau **Detroit, Mich.**

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9"x18" Porter Cable Lathe (2)
No. 324 Adriance Spinning
26"x10' LeBlond, Universal Crankshaft

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2" Pratt & Whitney spline (duplex) (Double)
No. 1 Foote Burt Surface Broach
New No. 3 Wigglesworth
No. 12 Knight Vertical
No. 30 Sunstrand Rigid Mill M.D.

TURRET LATHES

5D Potter & Johnstons
6D Potter & Johnston M.D.
2¼" & 24" Jones & Lamson steel HD. M.D.
3x36 Jones & Lamson steel Hd. M.D.
2 spindle Jones & Lamson steel Hd., M.D.
Goss & De Leeuw Chucking, 6"x6½"

DRILLS

3' Morris Radial En. Hd.M.D.
No. B16 Natco M.D. (2)
4 Spindle Taylor & Fenny M.D.

GEAR MACHINERY

6 Cimatool chamfering M.D.
No. 61 Fellows
No. 4—48" Brown & Sharpe Gear Cutter
Lees Bradner Gear Grinders (2)
9" Pratt & Whitney Gear Grinder

GRINDERS

No. 20 Heald Surface M.D.
No. 6 Bryant Internal M.D.
No. 72A-3 Heald Internal M.D.
No. 16A Blanchard M.D.

MISCELLANEOUS

8" Bullard Multimatic M.D.
15 KVA, Taylor Spot Welders
No. 1 Foote-Burt Duplex Surface Broach
8" Welland Standard Pipe Machine
No. 4 Hilles & Jones Double End Punch and Shear
No. 303 Bliss St. Side Gd. M.D.
No. 23 Steel Horning Press
2" Acme Bolt Threader

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MISCELLANEOUS MACHINES

#13 **NATCO** Mult. spdl. rect. hd. bored 16 spdls, with 8-1¼" spindles
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25" **Barnes** B.G. P.F. Sliding Head Drill
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#400 **Curtis Oil Extractor,** 2-bushel
4-spdl. **Henry & Wright,** 7" overhang
Rockford Sgl. End Hydraulic Boring Unit, with 3-sta., 54" dia. table
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15"x6' South Bend, loose change
16"x8' South Bend, loose change
18"x8' Champion, quick change
Broaching Machines, LaPointe, #1, #3
Drill Presses: 28", 24" Hoefer; 25", 20", 40" Bement
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2 50# Bradley upright hammers, m.d. like new
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Millers: 20"x24"x18" Ingersoll
No. 2 Becker, Vertical
Grinders: #20 Bryant Internal
300 other machinery items
Rock River ⅞" capacity punch and shear
MOTORS—new 5 H.P. for 3-phase, ball brg.

Also rebuilt motors.

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COLUMBUS, OHIO

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AUTOMATICS, Cleveland, ⅞" 4 spdle. Model M
AUTOMATICS, Cleveland 1¼ & 2" Model B, M.D.
AUTOMATICS, #22, 23 & 24 New Britain
GRINDERS, B. & S. #16 Plain 10"x72"
GRINDERS, Landis 10x36" Hydraulic, M.D.
MILLING MACHINE, Lees-Bradner #3 Thread
PLANERS, 60"x60"x15' Niles, 2 Rail Heads
PLANERS, Bedford & Patch, 36"x13' Open Side with 1 Rail & 1 Side Head
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo #14 & 14½ Horning, M. D.
PRESSES, Ferracute, P2, 3 & 4, Solid Back

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136', 8"x8" **Chicago Pneumatic Tool Co.**, type NSB.
136' 8"x8" **Ingersoll Rand**, type ERI.
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706' 17"x9¾"x12" **Sullivan**, class WJ3 angle compound
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No. 2 **Standard** screw type broaching press
No. 3 **LaPointe of Hudson**, screw type
No. 3 **J. N. LaPointe** double screw type
No. 3 **American** high speed, rack type

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20" **Excelsior** plain hand feed
20" **Silver** plain hand feed
20" **W. F. & J. Barnes** plain hand feed
21" **Superior** plain hand or back geared power feed, tapping attachment
21" **Cincinnati** plain hand feed
21" **Cincinnati** sliding head
21" **Cincinnati** direct geared mfg.
22" **Aurora** sliding head
22" **Barnes** sliding head, hand feed
22½" **W. F. & J. Barnes** stationary head, back gears, power feed
22½" **Mechanics plain** hand feed
24" **Cincinnati Bickford** sliding head, back geared power feed
24" **Cincinnati Drill Co.**, sliding head, power feed
25" **W. F. & J. Barnes** stationary head, back gears, power feed
25" **Superior** sliding head, back geared, power feed
26" **W. F. & J. Barnes** sliding head, back geared, power feed
26" **Bickford**, sliding head, back geared, power feed
26" **Hoefer** sliding head, back gears, power feed tapping attachment
28" **Aurora**, sliding sliding head, back gears, power feed
22½" **W. F. & John Barns**, 4 spdl. hy. dy.
24" **Barnes Drill Co.**, hy. dy. camel back

DRILLS, MISCELLANEOUS

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Garvin, Nos. 0 and 008, double end drilling and centering
Natco one and two-way lead screw tappers
Baker hydraulic, double end drill.
5 spindle **Detroit** automatic with fixtures
3 way **Foote Burt** for multiple heads
Avey motor driven unit heads, No. 2, ⅝" capacity
No. 3 **Millholland** two way drills, motor drive
4"x12" & 4"x72" **Sundstrand** double end drilling and centering
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8"x10" No. 1 **Lees Bradner** production hobber
14"x8" No. 5A **Lees Bradner** universal hobbers
26"x8" No. 3 **Brown & Sharpe** auto spur.
36"x6" **Gould & Eberhardt** spur gear cutter
48"x10" No. 4 **Brown & Sharpe** automatic spur
15" **Gleason** bevel gear quencher
Gleason circular finishing cutters, without blades
National Tool Co. (Cleveland) Model B gear and gear shaper cutter checking machine
Lipe gear tooth chamfering machine, double spindle
No. 3 **Barber Colman** gear hobber
18" **Gleason** bevel gear generator

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54" **McKay** 19 roll sheet leveler
Bay City bending rolls, 4"x3/16"

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Lewis alligator, 10" blade
Newbold gulliotine, 2" capacity
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36"x18 ga. Toledo No. 418 B.
No. 1 B **Campbell Nibbler**, 3/16"x24"
18" **Pels** all steel beam shear
10 KVA **"DYER"** Topeka 220 v. new

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12 KVA **American Electric Fusion**, type BW 16.
17 KVA **Thomson Gibb**, 440 V., spot
20 KVA **Agnew**, type 10D, 440 V., spot
20 KVA **Taylor**, 440 V., spot, 14" reach
20 KW **Taylor Moesta**, 440 V., portable gun type spot
20 KW **National**, spot, 28" reach, 220 Volt
23 KVA **Winfield**, 440 V., spot
25 KW **Winfield**, spot, 220 V.
25 KW **Winfield**, 220 V., butt
30 KVA **Thomson**, 220 V., butt
35 KW **Federal**, type 60, 440 V., automatic upset butt
65 KW **Federal**, type 10A, 440 V., butt
150 KVA **American Electric Fusion**, type HJ 10, 440 volt, air operated multiple welder
150 KVA **Swift** flash butt welder, 440 Volt
375 KVA **Fisher "Autocrat"** press type.

MISCELLANEOUS

6A **Potter & Johnston** automatics
4'x⅜" **Cincinnati** press brake
36" **Niles** car wheel vertical borer
22" 24" & 28" **Steinle** turret lathes
5" **Barrett** horizontal mill
4" **Beeman & Smith** double end boring mill
36" **Morton** draw cut shaper
12" **Dill** slotter.
3" No. 6 **Langelier** swager
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#2 & #3 Manville for wood screws #8 to #30. Lengths from ¾" to 6"

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3' & 6' **FOSDICK**; 4' **HAMMOND**; 6' **WESTERN**;

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SURFACE: No. 3 BROWN & SHARPE; No. 3W&M

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30' Pit, 156" face plate; Face plate drive
52"x22' **FIFIELD**; 24"x15' **New Haven, B.G.**
30"x16' **FIFIELD** Loose Change Gear, Back Grd.
28/48"x13' **HARRINGTON** Gap.
26/46"x20' **SCHUMACHER & BOYE**
24"x44"x18' **McCABE**, Double Spindle
20"x10' **AMERICAN** Grd. Hd.

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FRICTION: Nos. 2, 4 **RYERSON POWER FEED**;
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AEF: 15 KVA, 13 KVA, 9 KVA, 16", 18" thr.
FEDERAL: 50 KVA, 14 throat, 17 KVA Thomson; 40 & 50 KVA DYERS.
20 KVA Winfield, 24" throat.
SEAM: 25 KVA Thomson, 22" throat;

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CLEARING CRANKLESS TRIPLE ACTION
4 point suspension type; Bed 84"x133"; M.D.; All steel construction; Self-contained Gears enclosed running in oil.
NO. 97-H TOLEDO DOUBLE CRANK;
Double geared; Tie rod construction; 10" stroke; Distant bet. housings 173"; Bed 60"x 173"; pressure approx. 650 tons.
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Bed 36"x108".
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10" stroke, 97" bet. housings, M.D.
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12" Die Space, Bed 72"x26";

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17" x 8' Sidney H.D. Lathe, Q.C. 3SCD, D.B.G.
18" x 8' LeBlond Lathe, 3 S.C.D. D.B.G. Q.C.
21" x 10' LeBlond H.D. 3 S.C.D. B.B.G. Q.C.
20" x 8' American Lathe, 3 S.C.D. D.B.G. Q.C.
14" x 6' Lodge & Shipley Lathe, 3 S.C.D. D.B.G. Q.C.
20" x 8' LeBlond H.D. Lathe, 3 S.C.D. D.B.G. Q.C.
42" x 16' Niles Lathe, Standard Change, Cone Drive.
28" x 50" x 16' Rahn Larmon Slid. Bed Gap Lathe, Q. C.

GRINDERS

#60 Heald Internal, Belt Drive.
12" Pratt & Whitney Surface Belt Drive.
#14—20" Besley Disc Grinder, Belt Drive.
12" x 72" Cincinnati Universal, Belt Drive.
#41 Oliver Drill Grinder, M.D.

GEAR CUTTERS

#3—26" B & S Automatic Gear Cutter.
#1 Adams Gear Hobber, Belt Drive.

BORING MILLS

36" Bullard Vertical, Two Heads, M.D.

BOLT & PIPE THREADERS

4" Williams Pipe Machine.
2" Landis Pipe Machine.
2" Landis Dble. Spindle Bolt Threader.
½" Acme Bolt Cutter Class A.
1" Acme Bolt Cutter Class A.

RADIAL & UPRIGHT DRILLS

24" and 26" Barnes Upright Drills.
2' & 4' Fosdick Plain Radial Drills, S.P.D.
6' Niles Universal Radial Drill, S.P.D.

SHAPERS & PLANERS

24" Stockbridge Crank Shaper.
24" Queen City Crank Shaper.
48" x 48" x 20' Niles Planer.
24" x 24" x 6' Cincinnati, Planer.

CINCINNATI MACHINERY & SUPPLY CO.
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Offer 60" x 72" x 27' Niles Lathe, $7,500.00.
Also 34" x 18' Barrett Geared Head Pwr. Fd. to Tailstock, $4,500.00.
36" x 18' Putnam Oil Geared Head, 18 Speed, $7,600.00.

T. R. WIGGLESWORTH MACHINERY CO.
1721 Superior Cleveland, Ohio

500# B & S Board Drop Hammer.
800# B & S Board Drop Hammer.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
Bolt Cutters 1"x1½"-2"-3"-4" Acme.
2" P&W Double Spline Miller, B.D.
4' Bickford Radial Drill.
Grinder, surface #2 Diamond B.D.
42"x20' N.H. Grd. Head Lathe M.D.
No. 2 Baker Keyseater, 2"x20".
Pipe machines 2"—18".

WEST PENN MACHINERY COMPANY
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LATHES

18x8 Nat'l. 8 speed Grd. Hd.—Motor Dr.
20x15' Amer. Cone Dr. Quick Change
18x8' L. & S. Cone Dr. Quick Change
18x10' Monarch C. Dr. Quick Change
24"x22'—Lodge & Shipley Quick Change
24x48x15' S. Bove Emmas Dbl. Spdl.
24"x16' Bradford L.C. (C.D.)

LATHES

24x12 American 38 Quick Change
27x18' Lodge & Shipley Quick Change
28x10 New Haven L.C.
30x12" Niles L.C. (C.D.)

PLANER & SHAPER

24x24x7' Powell—1 Head.
24"—Cinn'ti Shaper Bk. Gd.

MISCELLANEOUS

5—Porter Cable Lathes MD.
8' Square Shear 16 Ga.
#2 Savage Nibbler ⅝" capacity.
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96½ Bliss DC Press, Bed 48" Rd.
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1—10" Rockford Production
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5—#14 Natco 14-16-17-18 Sp.
3—#30 Natco 24-36-48 Sp.
2—#32 Natco 42-60 Sp.
1—#36 Natco 36-sp.
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1—#4-29 Barnes Horizontal Multiple
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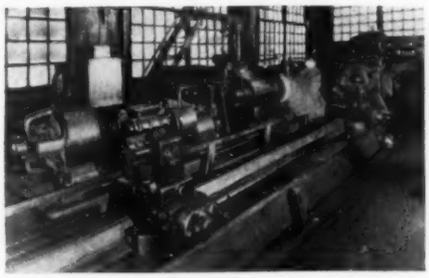

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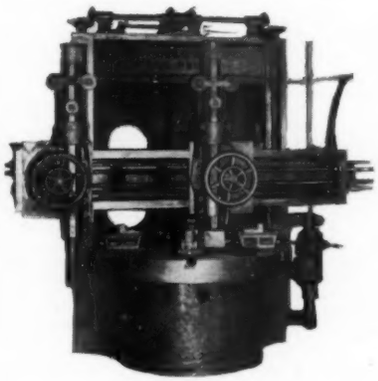

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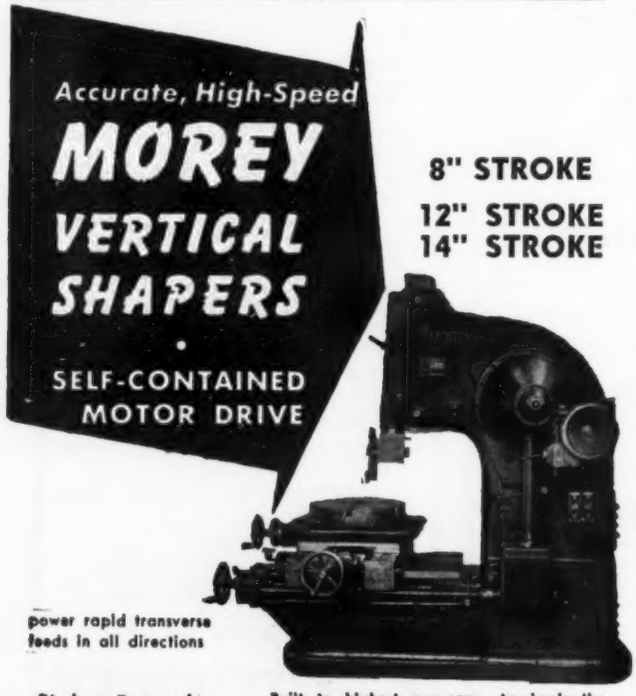
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Liberty Tool & Gage Wks., Providence, R. I.
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BEARINGS, Babbitt
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Bearings Co. of America, Lancaster, Pa.
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Federal Bearings Co., Poughkeepsie, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
S. K. F. Industries, Inc., Philadelphia
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BLADES, Cutter, Milling, Boring & Reaming (See **BITS, Tool**)

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Norma-Hoffmann Bearings Corp., Stamford, Conn.
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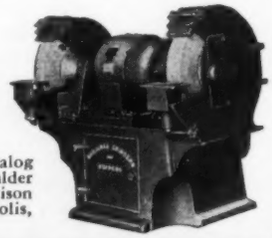

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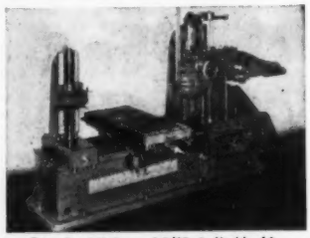

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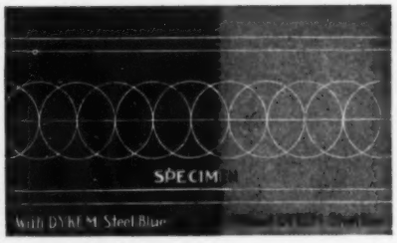

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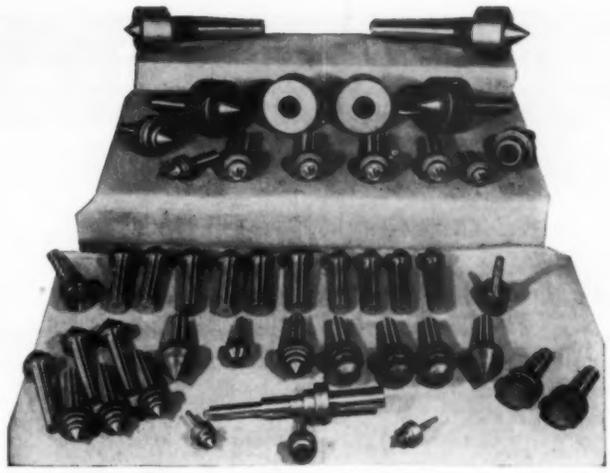

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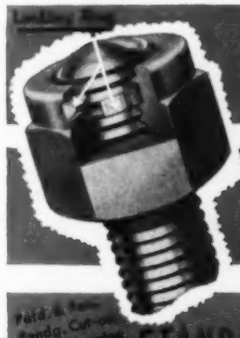

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New Britain-Gridley Machine Co., New Britain, Conn.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Van Norman Mach. Tool Co., Springfield, Mass.
Warner & Swasey Co., Cleveland

COMPARATORS, Dial
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.

COMPARATORS, Gear-Tooth & Screw-Thread
Farrel-Birmingham Co., Buffalo, N. Y.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.
Vard, Inc., Pasadena, Calif.

COMPASSES, Metal-Scribing (See **CALIPERS & COMPASSES**)

COMPOUNDS, Cleaning
Bullard Co., Bridgeport, Conn.
Detroit Rex Products Co., Detroit
Houghton & Co., E. F., Philadelphia
Oakite Products, N. Y. C.
Turco Products, Inc., Los Angeles

COMPOUNDS, Drawing, Metal & Wire
Houghton & Co., E. F., Philadelphia
Shell Oil Co., Inc., N. Y. C.

COMPOUNDS, Grinding & Polishing
Carborundum Co., Niagara Falls, N. Y.
National Broach & Machine Co., Detroit
Norton Co., Worcester, Mass.

COMPOUNDS, Plastic Molding
Bakelite Corp., N. Y. C.
Dow Chemical Co., Midland, Mich.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

COMPOUNDS, Tempering & Case-Hardening
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Strong, Carlisle & Hammond Co., Cleveland
Stuart Oil Co., D. A., Chicago

COMPRESSORS, Air & Gas
Allis-Chalmers Mfg. Co., Milwaukee
American Gas Furn. Co., Elizabeth, N. J.
Curtis Pneumatic Machry. Co., St. Louis
General Electric Co., Schenectady, N. Y.
Wright Mfg. Div. of Amer. Chain & Cable Co., York, Pa.

CONSULTANTS
Trundle Engrg. Co., Cleveland

CONTRACT WORK (See also Index, last page)
Aluminum Co. of America, Pittsburgh
Baldwin Southwark Corp., Philadelphia
Bayard & Co., M. L., Philadelphia
Chapman-Valve Mfg. Co., Boston (Heat-Treating)
Chromium Corp. of Amer., N.Y.C. (Plating)
Eastern Machine Screw Corp., New Haven, Conn.
Elmes Engrg. Wks., Chas. F., Chicago
Ericcson Screw Machine Prod. Inc., Brooklyn, N. Y.
Excello Corp., Detroit (Heat-Treating)
Fenn Mfg. Co., Hartford, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Hartford Special Machy. Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati
Carlyle Johnson Machine Co., Manchester, Conn.
Kent-Owens Machine Co., Toledo, O.
Kropp Forge Co., Chicago (Forgings)
Liberty Tool & Gage Wks., Providence, R. I. (Jigs & Fixtures)
Makepeace Co., D. E., Attleboro, Mass.
Meisel Press Mfg. Co., Boston
National Acme Co., Cleveland
National Twist Drill & Tool Co., Detroit
New Britain-Gridley Machine Co., New Britain, Conn. (Screw Machine Products)
Revere Copper & Brass, Inc., N. Y. C. (Forgings)
Surface Combustion Corp., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
United Chromium, Inc., N. Y. C., (Plating)
Vard, Inc., Pasadena, Calif.
Watson-Stillman Co., Roselle, N. J.
Williams & Co., J. H., N. Y. C.

CONTOUR MACHINES
Continental Machines, Inc., Minneapolis
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

CONTROLLERS, Motor
Allen-Bradley Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland
Square D Co., Milwaukee
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

CONTROLLERS, Pressure & Temperature
American Gas Furn. Co., Elizabeth, N. J.
Brown Instrument Co., Philadelphia
Lindberg Engrg. Co., Chicago

CONTROLS, Flexible-Shaft (See **SHAFTS, Flexible**)

CONTROLS, Furnace
American Gas Furn. Co., Elizabeth, N. J.
Brown Instrument Co., Philadelphia
Lindberg Engrg. Co., Chicago
Strong, Carlisle & Hammond Mach. Co., Cleveland

CONTROLS, Hydraulic
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Sundstrand Mach. Tool Co., Rockford, Ill.
Watson-Stillman Co., Roselle, N. J.

CONVEYORS
Allis-Chalmers Mfg. Co., Milwaukee
Mathews Conveyer Co., Ellwood City, Pa.
Standard Conveyor Co., N. St. Paul, Minn.

COOLANTS, Cutting, Drilling & Grinding
Carborundum Co., Niagara Falls, N. Y.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Shell Oil Co., Inc., N. Y. C.
Socony-Vacuum Oil Co., Inc., N. Y. C.
Standard Oil Co. of Ind., Chicago
Stuart Oil Co., Ltd., D. A., Chicago
Sun Oil Co., Philadelphia
Tidewater Associated Oil Co., N. Y. C.

COUNTERBORES
Barnes Drill Co., Rockford, Ill.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.

COUNTERSHAFTS
American Tool Works Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Earle Gear & Mach. Co., Philadelphia
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
Hill Acme Co., Cleveland
LeBlond Mach. Tool Co., R. K., Cincinnati
Rivett Lathe & Grinder, Inc., Boston
Stow Mfg. Co., Binghamton, N. Y.
Warner & Swasey Co., Cleveland

COUNTERSINKS (See **DRILLS, Twist**)

COUNTERS, Revolution & Stroke
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

COUPLINGS, Hose
Cleveland Pneu. Tool Co., Cleveland
Schrader's, Son, A., Brooklyn, N. Y.

COUPLINGS, Shaft, Flexible
Allis-Chalmers Mfg. Co., Milwaukee
Delta Mfg. Co., Milwaukee
Earle Gear & Mach. Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N. Y.
Hill Acme Co., Cleveland
Morse Chain Co., Ithaca, N. Y.
Nicholson & Co., W. H., Wilkes-Barre, Pa.

COUPLINGS, Shaft, Non-Flexible
General Electric Co., Schenectady, N. Y.
Hill Acme Co., Cleveland
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Jib
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machy. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Portable
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Overhead Traveling
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machry. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CUSHIONS, Die
V. & O. Press Co., Hudson, N. Y.

CUTTERS, Angle
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Detroit
Ex-Cell-O Corp., Detroit

WHERE-TO-BUY DIRECTORY

Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
McCrosky Tool Co., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago

CUTTERS, Die-Sinking
Detroit Tap & Tool Co., Detroit
Gairing Tool Co., Detroit
Gorton Machine Co., Geo., Racine, Wis.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.

CUTTERS, Formed
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Detroit
Cleveland Twist Drill Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Tomkins Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Weldon Tool Co., Cleveland

CUTTERS, Gear
Adams Co., Dubuque, Iowa
Bantam Bearings Corp., S. Bend, Ind.
Barber-Colman Co., Rockford, Ill.
Bilgram Gear & Mach. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Cross Gear & Machine Co., Detroit
Farrel-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Scherr Co., Geo., N. Y. C.
Standard Tool Co., Cleveland
Stow Mfg. Co., Binghamton, N. Y.
Taylor Machine Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Waltham Mach. Wks., Waltham, Mass.

CUTTERS, Hand Pipe (See **STOCKS, DIES & CUTTERS, Pipe**)

CUTTERS, Keyseater
Baker Bros., Inc., Toledo, O.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Davis Keyseater Co., Rochester, N. Y.
Ex-Cell-O Corp., Detroit
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Mitts & Merrill, Saginaw, Mich.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
National Machine Tool Co., Cincinnati
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

CUTTERS, Milling
Adams Company, Dubuque, Ia.
Atlas Press Co., Kalamazoo, Mich.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Gorton Mach. Co., George, Racine, Wis.
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Kearney & Trecker Corp., Milwaukee
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit
Modern Tool Works, Rochester, N. Y.
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Waltham Mach. Wks., Waltham, Mass.
Weldon Tool Co., Cleveland
Williams & Co., J. H., N. Y. C.

CUTTING-OFF MACHINES (See **SAWS**)

CUTTING-OFF MACHINES, Abrasive-Wheel
Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Campbell Div., Andrew C., American Chain & Cable Co., Bridgeport, Conn.
de Sanno & Sons, Inc., A. P., Philadelphia
Porter McLeod Machine Tool Co., Inc., Hatfield, Mass.
Racine Tool & Mach. Co., Racine, Wis.

CYLINDERS, Air (See **TANKS & CYLINDERS, Air**)

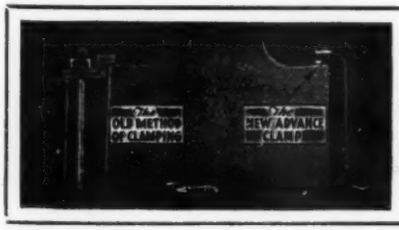
CYLINDERS, Hydraulic (See **PRESSES, Hydraulic**)

DEALERS, Machinery (See **Searchlight Section**)

DEGREASERS (See **Metal Cleaning Equipment**)

DEMAGNETIZERS
Abrasive Machine Tool Co., E. Providence, R. I.
Blanchard Mach. Co., Cambridge, Mass.
L-W Chuck Co., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

DIAMONDS, Industrial
Carboloy Co. Inc., Detroit
Crafts Co., Inc., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Smit & Sons, Inc., J. K., N. Y. C.



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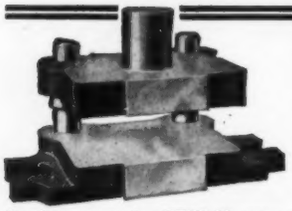

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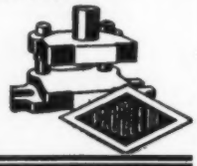

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DIE-CASTING MACHINES
Continental Machines, Inc., Minneapolis
Reed-Prentice Corp., Worcester, Mass.

DIE-HEADS, Threading
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap and Die Corp., Greenfield, Mass.
Hill Acme Co., Cleveland
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., Cleveland

DIE-MAKERS' SUPPLIES
Baumbach Mfg. Co., E. A., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., Detroit
Danly Mach. Specialties, Inc., Chicago
Dykem Co., St. Louis
Lufkin Rule Co., Saginaw, Mich.
Masonite Corp., Chicago
Producto Mach. Co., Bridgeport, Conn.
Starrett Co., L. S., Athol, Mass.

DIE-MAKING & CUTTING MACHINES
Cincinnati Milling Mach. Co., Cincinnati
Continental Machines, Inc., Minneapolis
Gorton Machine Co., Geo., Racine, Wis.
Henry & Wright Mfg. Co., Hartford, Conn.
Illinois Tool Works, Chicago
Johnson Tool Co., E. Providence, R. I.
Peerless Machine Co., Racine, Wis.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.

DIE-SETS
Baumbach Mfg. Co., E. A., Chicago
Card Mfg. Co., S. W., Mansfield, Mass.
Dandy Mach. Specialties, Inc., Chicago
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DIE-SINKING MACHINES
Cincinnati Milling Mach. Co., Cincinnati
Gorton Machine Co., Geo., Racine, Wis.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.

DIES, Marking & Embossing
Acromark Co., Elizabeth, N. J.
Cunningham Co., M. E., Pittsburgh
Matthews & Co., Jas. H., Pittsburgh
Noble & Westbrook Mfg. Co., East Hartford, Conn.

DIES, Screw-Cutting, Adjustable
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Threadwell Tap & Die Co., Greenfield, Mass.

DIES, Sheet-Metal & Forging
Hamilton Tool Co., Hamilton, O.
Scully-Jones & Co., Chicago
Taft-Peirce Mfg. Co., Woonsocket, R. I.

DIES, Solid Bolt & Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Consolidated Machine Tool Corp., Rochester, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Warner & Swasey Co., Cleveland

DIES, Sub-Press
Baumbach Mfg. Co., E. A., Chicago
Danly Mach. Specialties, Inc., Chicago
Producto Machine Co., Bridgeport, Conn.
V & O Press Co., Hudson, N. Y.
Waltham Mach. Works, Waltham, Mass

DIES, Wire-Drawing & Extrusion
Carboloy Co., Inc., Detroit
Crafts Co., Arthur A., Boston
Firth-Sterling Steel Co., McKeesport, Pa.
Illinois Tool Works, Chicago
Metal Carbides Corp., Youngstown, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vascoloy-Ramet Corp., N. Chicago, Ill.

DISKS, Abrasive (See **WHEELS, Grinding & Polishing**)

DISKS, Circular Cutting
Atkins & Co., E. C., Indianapolis
Disston & Sons, Inc., Henry, Philadelphia
Morse Twist Drill and Machine Co., New Bedford, Mass.

DIVIDERS (See **CALIPERS & COMPASSES**)

DOGS, Lathe & Milling-Machine
Armstrong Bros. Tool Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Hendey Machine Co., Torrington, Conn.
LeBlond Mach. Tool Co., R. K., Cincinnati
Ready Tool Co., Bridgeport, Conn.
Sturdimatic Tool Co., Detroit
Williams & Co., J. H., N. Y. C.

DRESSERS, Grinding Wheel
American Swiss File & Tool Co., Elizabeth, N. J.
Atkins & Co., E. C., Indianapolis
Black & Decker Mfg. Co., Towson, Md.
Carboloy Co., Inc., Detroit
Carborundum Co., Niagara Falls, N. Y.
Chicago Wheel & Mfg. Co., Chicago
Crafts Co., Inc., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Disston & Sons, Inc., Henry, Philadelphia
Dumore Co., Racine, Wis.
Metal Carbides Corp., Youngstown, O.
Norton Co., Worcester, Mass.
Schultz & Anderson Co., Newark (Radius)
Smit & Sons, J. K., N. Y. C.
Standard Tool Co., Cleveland
Victor Machinery Exchange, N. Y. C.

DRESSING, Belt
Houghton & Co., E. F., Philadelphia
Tide Water Associated Oil Co., N. Y. C.
White & Bagley, Worcester, Mass.

DRIERS, Centrifugal
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.

DRIFTS, Drill
Armstrong Bros. Tool Co., Chicago
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Williams & Co., J. H., N. Y. C.

DRILLROD, Steel Tool (See **STEEL, Tool**)

DRILLS, Automatic & Semi-Automatic
Avey Drilling Machine Co., Cincinnati
Baker Bros., Inc., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Bodine Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Cross Gear and Machine Co., Detroit
Davis & Thompson Co., Milwaukee
Ex-Cell-O Corp., Detroit
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati

WHERE-TO-BUY DIRECTORY

Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.

DRILLS, Bench
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Barnes Co., W. F. & John, Rockford, Ill.
Black & Decker Mfg. Co., Towson, Md.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Ryerson & Son, Jos. T., Chicago
Schauer Mach. Co., Cincinnati
Skilsaw, Inc., Chicago
Walker-Turner Co., Plainfield, N. J.

DRILLS, Breast (See **TOOLS, Hand**)

DRILLS, Center
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill and Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Div. Niles-Bement-Pond Co., Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

DRILLS, Column-Type
Atlas Press Co., Kalamazoo, Mich.
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Dalzen Tool & Mfg. Co., Detroit
Davis & Thompson Co., Milwaukee
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
General Machy. Corp., Hamilton, O.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
Snyder Tool & Engrg. Co., Detroit

DRILLS, Core
Carboloy Co., Inc., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

DRILLS, Flat (See **DRILLS, Twist & Flat**)

DRILLS, Hand (See **TOOLS, Hand**)

DRILLS, Horizontal
Avey Drilling Machine Co., Cincinnati
Baker Bros. Inc., Toledo, Ohio
Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bradford Machine Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
Murchey Machine and Tool Co., Detroit
National Auto. Tool Co., Richmond, Ind.
Ryerson & Son, Jos. T., Chicago
Sellers & Co., Inc., Wm., Philadelphia
Snyder Tool & Engrg. Co., Detroit
Universal Boring Mach. Co., Hudson, Mass.

DRILLS, Deep-Hole
Barnes Co., W. F. & John, Rockford, Ill.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DRILLS, Multi-Spindle or Gang
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Baker Bros. Inc., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bodine Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., Milwaukee
Delta Mfg. Co., Milwaukee
Ex-Cell-O Corp., Detroit
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Snyder Tool & Engrg. Co., Detroit

DRILLS, Portable Electric (See **TOOLS, Portable Electric**)

DRILLS, Portable Pneumatic (See **TOOLS, Portable Pneumatic**)

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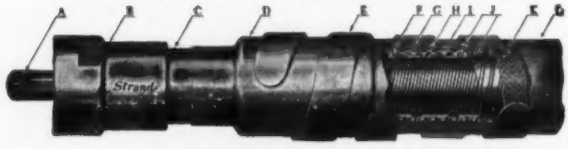

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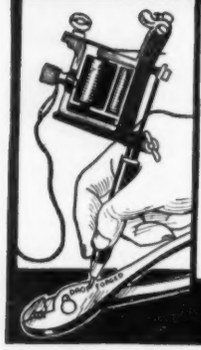

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American Tool Works Co., Cincinnati
Bryant Machinery & Engrg. Co., Chicago
Carlton Machine Tool Co., Cincinnati
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Mach. Tool Co. Cincinnati
Cleveland Punch & Shear Works, Inc., Cleveland
Fosdick Machine Tool Co., Cincinnati
General Machy. Corp., Hamilton, O.
Leland-Gifford Co., Worcester, Mass.
Morris Machine Tool Co., Cincinnati

DRILLS, Sensitive
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Dalzen Tool & Mfg. Co., Detroit
Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
National Auto. Tool Co., Richmond, Ind.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Scherr Co., Geo., N. Y. C.
Walker-Turner Co., Inc., Plainfield, N. J.

DRILLS, Twist & Flat
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

DRIVES, Machine
Cincinnati Lathe & Tool Co., Cincinnati
Dayton Rubber Mfg. Co., Dayton, O.
Drive-All Mfg. Co., Detroit
General Electric Co., Schenectady, N. Y.
Hardinge Brothers, Inc., Elmira, N. Y.
Reed-Prentice Co., Worcester, Mass.
Reliance Elec. & Engrg. Co., Cleveland
Rivett Lathe & Grinder, Inc., Boston
Sebastian Lathe Co., Cincinnati
Sheldon Mach. Co., Chicago
Turner Machinery Co., Kansas City, Mo.

DRIVES, Variable-Speed (See **TRANSMISSIONS, Variable-Speed**)

DRIVES, "V"-Belt
Allis-Chalmers Mfg. Co., Milwaukee
American Pulley Co., Philadelphia
Dayton Rubber Mfg. Co., Dayton, O.
Gates Rubber Co., Denver, Colo.

DRIVES, Worm
Adams Company, Dubuque, Iowa
Bilgram Gear & Mach. Wks., Philadelphia
Detroit Tap & Tool Co., Detroit
Earle Gear & Mach. Co., Philadelphia
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
Grant Gear Works, Boston
Michigan Tool Co., Detroit
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia

DRYING Machines (See **MACHINES, Washing and Drying**)

DUPLICATORS, Pantographic
Detroit Universal Duplicator Co., Detroit

ELECTRODES, Welding
Air Reduction, N. Y. C.
Aluminum Co. of America, Pittsburgh
American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee
Haynes-Stellite Co., N. Y. C.
Lincoln Electric Co., Cleveland
McKay Co., Pittsburgh, Pa.
Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
Roebling's Sons Co., John A., Trenton, N. J.
Ryerson & Son, Inc., Jos. T., Chicago
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

ENAMELING & GALVANIZING MACHINES, Centrifugal
Barrett Co., Leon J., Worcester, Mass.

ENAMELS (See **PAINTS, VARNISHES etc.**)

ENGRAVING MACHINES
Gorton Machine Co., Geo., Racine, Wis.
Moore Mfg. Co., Wm., Chicago
Reed-Prentice Co., Worcester, Mass.

EXTRACTORS, Centrifugal Oil (See **SEPARATORS, Centrifugal**)

EXTRACTORS, Screw
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland

FANS, Man-Cooler (See **BLOWERS**)

FEEDS, Die (See **FEEDS, Press**)

FEEDS, Hydraulic
American Engineering Co., Philadelphia
Ex-Cell-O Tool Corp., Detroit
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Sundstrand Mach. Tool Co., Rockford, Ill.

FEEDS, Press
Federal Press Co., Elkhart, Ind.
Henry & Wright Mfg. Co., Hartford, Conn.
Nilson Mach. Co., A. H., Bridgeport, Conn.
Producto Machine Co., Bridgeport, Conn.
Schrader's Sons, A., N. Y. C.
V. & O. Press Co., Hudson, N. Y.
Yoder Co., Cleveland
Zen & Hahnemann Co., Newark, N. J.

FILE BANDS
Do All Co., Inc., Des Plaines, Ill.

FILES & RASPS
American Swiss File & Tool Co., Elizabeth, N. J.
Atkins & Co., E. C., Indianapolis
Disston & Sons, Inc., Henry, Philadelphia
Nicholson File Co., Providence, R. I.
Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Inc., Binghamton, N. Y.
Strand & Co., N. A., Chicago

FILES, Rotary
Disston & Sons, Inc., Henry, Philadelphia
Hamilton Tool Co., Hamilton, O.
Strand & Co., N. A., Chicago

FILING MACHINES, Die
Ames Co., B. C., Waltham, Mass.
Continental Machines Inc., Milwaukee
Do All Co., Inc., Des Plaines, Ill.
Illinois Tool Co., Chicago
Oliver Instrument Co., Adrian, Mich.

FILTERS, Air
Cleveland Pneu. Tool Co., Cleveland
Curtis Pneu. Machy. Co., St. Louis
Norton Company, Worcester, Mass.

FINGERS, Feed
Eastern Machine Screw Corp., New Haven, Conn.
Hardinge Brothers, Inc., Elmira, N. Y.
Mitts & Merrill, Saginaw, Mich.
Rivett Lathe & Grinder, Inc., Boston

FITTINGS, Hydraulic
Lamson & Sessions Co., Cleveland
Watson-Stillman Co., Roselle, N. J.

FITTINGS, Wire-Rope
American Chain & Cable Co., Bridgeport, Conn.
American Steel & Wire Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Republic Steel Corp., Cleveland
Roebling's Sons Co., John A., Trenton, N.J.
Williams & Co., J. H., N. Y. C.

FIXTURES, Indexing
Brown & Sharpe Mfg. Co., Providence, R. I.
Hartford Special Machinery Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati

FLAME-CUTTING MACHINES
Air Reduction, N. Y. C.
Oster Mfg. Co., Cleveland

FLEXIBLE SHAFT EQUIPMENT
Haskins Mfg. Co., R. G., Chicago
Strand Mfg. Co., N. A., Chicago

WHERE-TO-BUY DIRECTORY

FLUX, Liquid & Paste
Air Reduction, N. Y. C.
Atkins & Co., E. C., Indianapolis
Lincoln Electric Co., Cleveland

FORGES
Buffalo Forge Co., Buffalo, N. Y.

FORGING MACHINES (See also PRESSES, Forging)
Ajax Mfg. Co., Euclid, Cleveland
Elmes Engrg. Wks., Chas. F., Chicago
Hill-Acme Co., Cleveland

FORMING Machines
Ajax Mfg. Co., Euclid, Cleveland
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Wks., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
Elmes Engrg. Works, Chas. F., Chicago
Farrel-Birmingham Co., Ansonia, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Watson-Stillman Co., Roselle, N. J.
Yoder Co., Cleveland
Zeh & Hahnemann Co., Newark, N. J.

FURNACES, Electric
Electric Furnace Co., Salem, O.
General Electric Co., Schenectady, N. Y.
Lindberg Engineering Co., Chicago
Surface Combustion Corp., Toledo, O.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

FURNACES, Gas
American Gas Furn. Co., Elizabeth, N. J.
Chicago Flexible Shaft Co., Chicago
Electric Furnace Co., Salem, Ohio
Hones, Inc., Chas. A. Baldwin, N. Y.
Lindberg Engineering Co., Chicago
Strong, Carlisle & Hammond Co., Cleveland
Surface Combustion Corp., Toledo, O.

FURNACES, Oil
Chicago Flexible Shaft Co., Chicago
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo

FURNITURE, Shop
Black & Decker Mfg. Co., Towson, Md. (Drill Stands)
Hamilton Tool Co., Hamilton, O.
Lyon Metal Prod., Inc., Aurora, Ill.
New Britain-Gridley Machine Co., New Britain, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

GAGES, Amplifying
Federal Products Corp., Providence, R. I.
Pratt & Whitney Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.

GAGES, Caliper
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Williams Co., J. H., N. Y. C.

GAGES, Comparator
Ames Co., B. C., Waltham, Mass.
Federal Products Corp., Providence, R. I.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Drill-Center
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Morse Twist Drill Co., New Bedford, Mass.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

GAGES, Height
Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Lufkin Rule Co., Saginaw, Mich.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

GAGES, Plug & Ring
Brown & Sharpe Mfg. Co., Providence, R. I.
Cadillac Gage Co., Detroit
Carboloy Co., Detroit
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Federal Products Corp., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Lincoln Park Tool & Gage Co., Lincoln Park, Mich.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.
Williams Co., J. H., N. Y. C.

GAGES, Pressure
Baldwin-Southwark Corp., Philadelphia
Brown Instrument Co., Philadelphia

GAGES, Profile
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Snap (See **GAGES, Plug & Ring**)

GAGES, Surface
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

GAGES, Thickness
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Randall & Stickney Co., Waltham, Mass.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread
Brown & Sharpe Mfg. Co., Providence, R. I.
Cadillac Gage Co., Detroit
Detroit Tap & Tool Co., Detroit
Federal Products Corp., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Mach. Co., Hartford, Conn.
Lufkin Rule Co., Saginaw, Mich.
Michigan Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.

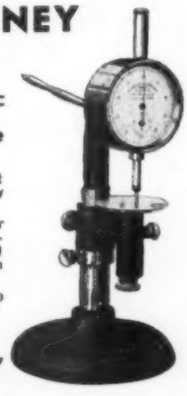
GAGES, Wire
Atkins & Co., E. C., Indianapolis
Brown & Sharpe Mfg. Co., Providence, R. I.
Disston & Sons, Inc., Henry, Philadelphia
Federal Products Corp., Providence, R. I.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Starrett Co., L. S., Athol, Mass.

GALVANIZING MACHINES (See ENAMELING & GALVANIZING MACHINES)

GASES, Compressed
Air Reduction, N. Y. C.

GEAR-CUTTING MACHINES
Adams Co., Dubuque, Iowa
Barber-Colman Co., Rockford, Ill.
Bilgram Gear & Mach. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Cross Gear & Machine Co., Detroit
Farrel-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
General Mach. Corp., Hamilton, O.
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
National Broach & Machine Co., Detroit
National Tool Co., Cleveland
Newark Gear Cutting Mach. Co., Newark, N. J.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Waltham Mach. Wks., Waltham, Mass.

RANDALL & STICKNEY
Universal Gauge



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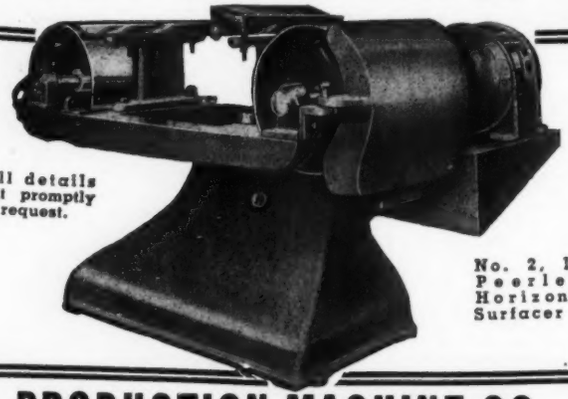

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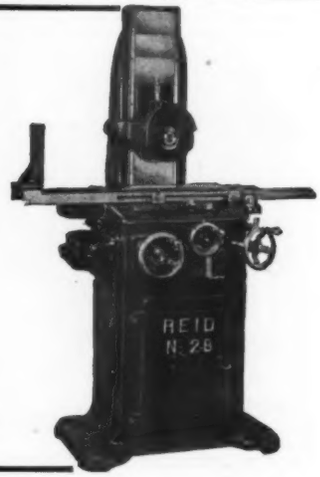

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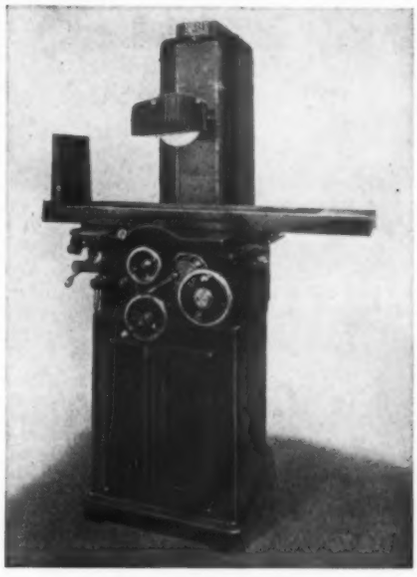

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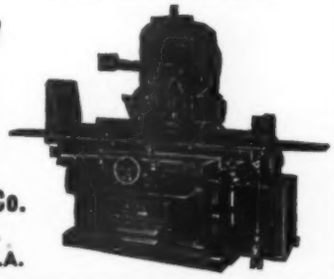

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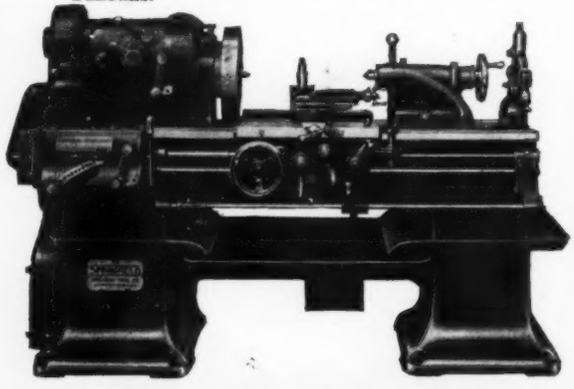

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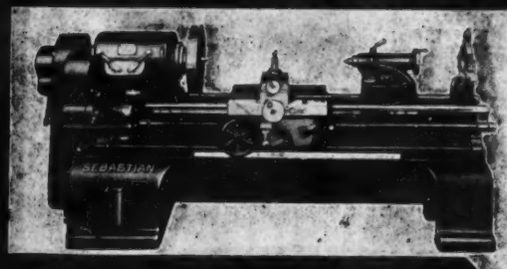

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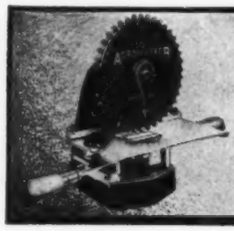

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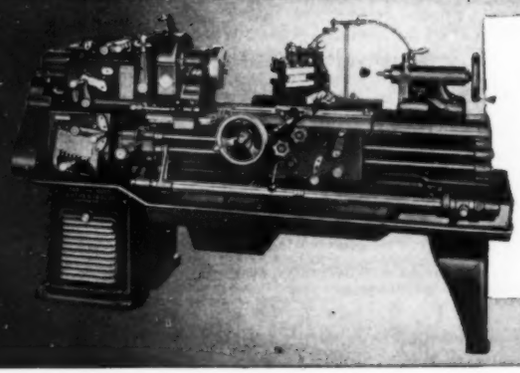

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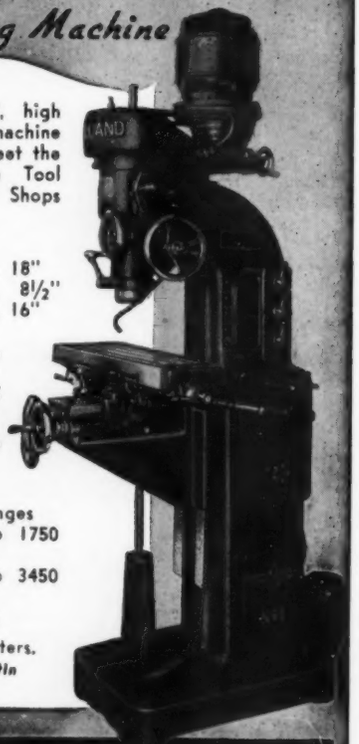

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MOTORS, Hydraulic (see also **PUMPS, Hydraulic**)
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Sundstrand Mach. Tool Co., Rockford, Ill.

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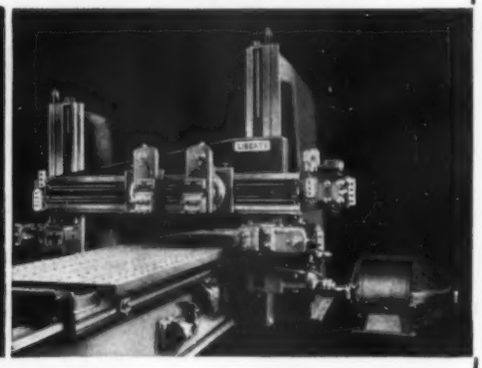

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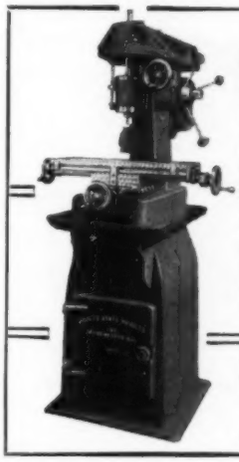

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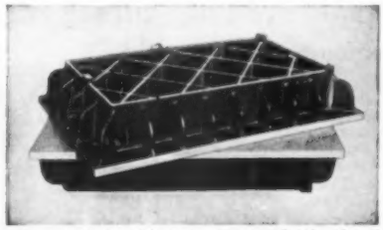

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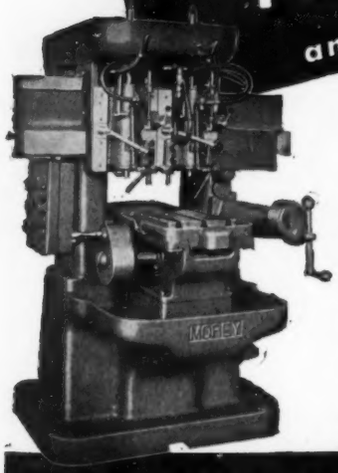

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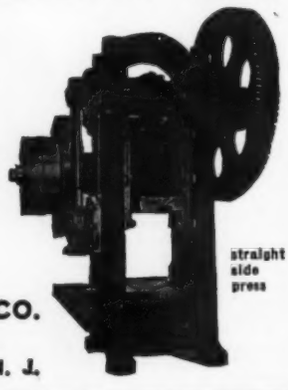

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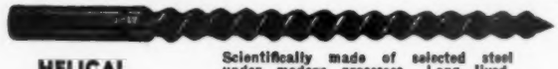

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Ajax Mfg. Co., Cleveland
Bethlehem Steel Co., Bethlehem, Pa.

ROPE, Wire
American Cable Div. of Am. Chain & Cable Co., N. Y. C.
Bethlehem Steel Co., Bethlehem, Pa.
Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
Roebling's Sons Co., John A., Trenton, N. J.
Ryerson & Son, Inc., Jos. T., Chicago

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Consolidated Mach. Tool Corp., Rochester, N. Y.
Gorton Machine Co., Geo., Racine, Wis.
Knight Machy. Co., W. B., St. Louis
Onsrud Machine Works, Chicago
Reed-Prentice Corp., Worcester, Mass.

RULES, Machinists'
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

RUSTPROOFING & SLUSHING COMPOUNDS
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Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Oakite Products Co., N. Y. C.
Socony-Vacuum Oil Co., Inc., N. Y. C.
Standard Oil Co. of Indiana, Chicago
Tidewater Oil Co., N. Y. C.

SAFETY EQUIPMENT
American Optical Co., Southbridge, Mass.
Littleford Bros., Cincinnati
Junkin Safety Appliance Co., Inc., Lewisville, Ky.

SANDERS, Machine & Portable
Black & Decker Mfg. Co., Towson, Md.
Carborundum Co., Niagara Falls, N. Y.
Delta Mfg. Co., Milwaukee
Haskins Co., R. G., Chicago
Jefferson Machine Tool Co., Cincinnati
Mattison Machine Works, Rockford, Ill.
Porter-Cable Mach. Co., Syracuse, N. Y.
Production Mach. Co., Greenfield, Mass.
Rotor Tool Co., Cleveland
Skilsaw, Inc., Chicago
Stow Mfg. Co., Binghamton, N. Y.
Strand Co., N. A., Chicago
Walker-Turner Co., Plainfield, N. J.
Walls Sales Corp., N. Y. C.

SAW BLADES, Circular Metal-Cutting
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland

SAW BLADES, Hack & Band (See **BLADES, Hack & Band-Saw**)

SAWS, Band, Metal-Cutting (Machines)
Armstrong-Blum Mfg. Co., Chicago
Atkins & Co., E. C., Indianapolis
Avey Drilling Mach. Co., Cincinnati
Capewell Mfg. Co., Hartford, Conn.
Continental Machines, Inc., Minneapolis
Delta Mfg. Co., Milwaukee
Peerless Machine Co., Racine, Wis.
Racine Tool & Machine Co., Racine, Wis.
Reed-Prentice Corp., Worcester, Mass.
Ryerson & Son, Inc., Jos. T., Chicago
Starrett Co., L. S., Athol, Mass.
Walker-Turner Co., Plainfield, N. J.

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Delta Mfg. Co., Milwaukee
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Earle Gear & Machine Co., Philadelphia
Motch & Merryweather Co., Cleveland
Porter-McLeod Machine Tool Co., Hatfield, Mass.

SAWS, Circular, Wood-Cutting (Machine)
Atkins & Co., E. C., Indianapolis
Curtis Pneumatic Machy. Co., St. Louis
Delta Mfg. Co., Milwaukee
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Mattison Machine Works, Rockford, Ill.
Walker-Turner Co., Inc., Plainfield, N. J.

SAWS, Friction
Ryerson & Son, Inc., Jos. T., Chicago

SAWS, Hack (See **TOOLS, Hand**)

SAWS, Hole
Armstrong-Blum Co., Chicago
Atkins & Co., E. C., Indianapolis
Avey Drilling Mach. Co., Cincinnati
Black & Decker Mfg. Co., Towson, Md.
Earle Gear & Machine Co., Philadelphia
Schrader's Sons, A., N. Y. C.
Skilsaw, Inc., Chicago
Williams & Co., J. H., N. Y. C.

SAWS, Portable (See **TOOLS, Portable**)

SAWS, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Atkins & Co., E. C., Indianapolis
Capewell Mfg. Co., Hartford, Conn.
Covel Mfg. Co., Benton Harbor, Mich.
L-W Chuck Co., Toledo, Ohio
Oster Mfg. Co., Cleveland
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Ryerson & Son, Inc., Jos. T., Chicago

SCRAPERS, Hand (See **TOOLS, Hand**)

SCRAPERS, Power
Black & Decker Mfg. Co., Towson, Md.

SCREWDRIVERS, Flexible-Shaft (See **TOOLS, Flexible-Shaft**)

SCREWDRIVERS, Hand (See **TOOLS, Hand**)

SCREWDRIVERS, Portable Electric & Pneumatic (See **TOOLS, Portable**)

SCREWDRIVING & NUT-SETTING MACHINES
Bodine Corp., Bridgeport, Conn.
Haskins Co., R. G., Chicago
Producto Machine Co., Bridgeport, Conn.
Schauer Machine Co., Cincinnati
Strand & Co., N. A., Chicago

SCREW-MACHINES, Automatic
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Foote-Burt Co., Cleveland
Greenlee Bros. & Co., Rockford, Ill.
National Acme Co., Cleveland
New Britain-Gridley Mach. Div., New Britain, Conn.
Scherr Co., Inc., George, N. Y. C.
Warner & Swasey Co., Cleveland

SCREW-MACHINES, Plain & Hand
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Mach. Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Jones & Lamson Mach. Co., Springfield, Vt.
National Acme Co., Cleveland
Rivett Lathe & Grinder, Inc., Boston
Warner & Swasey Co., Cleveland

SCREW PLATES (See **DIES, Screw-Cutting, Adjustable**)

SCREWS, Cap and Set
Allen Mfg. Co., Hartford, Conn.
Baumbach Mfg. Co., E. A., Chicago
Danly Machine Specialties, Inc., Chicago
Eastern Machine Screw Corp., New Haven, Conn.
Lamson & Sessions Co., Cleveland
National Acme Co., Cleveland
Parker-Kalon Corp., N. Y. C.
Republic Steel Corp., Cleveland, O.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., Cleveland

SCREWS, Machine
Allen Mfg. Co., Hartford, Conn.
Eastern Machine Screw Corp., New Haven, Conn.
Lamson & Sessions Co., Cleveland
Republic Steel Co., Cleveland
Strong, Carlisle & Hammond Co., Cleveland

WHERE-TO-BUY DIRECTORY

SCREWS, Recessed Head
American Screw Co., Providence, R. I.
Central Screw Co., Chicago
Chandler Products Corp., Cleveland
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit
Lamson & Sessions Co., Cleveland
National Screw & Mfg. Co., Cleveland
New England Screw Co., Keene, N. H.
Parker Co., Charles, Meriden, Conn.
Parker-Kalon Corp., N. Y. C.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoli Mfg. Co., Chicago, Ill.
Phillips Screw Mfrs., Providence, R. I.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Shakeproof Lock Washer Co., Chicago
Southington Hardware Mfg. Co., Southington, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.
Whitney Screw Corp., Nashua, N. H.

SCREWS, Self-Tapping
Parker-Kalon Corp., N. Y. C.

SCREWS, Thumb & Wing
Parker-Kalon Corp., N. Y. C.
Williams & Co., J. H., N. Y. C.

SCRIBERS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

SEPARATORS, Centrifugal
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.
National Acme Co., Cleveland

SETS, Rivet
American Swiss File & Tool Co., Elizabeth, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., Cleveland

SETTERS, Nut (See **TOOLS, Portable**)

SHAFTING, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Earle Gear & Mach. Co., Philadelphia
Jones & Laughlin Steel Corp., Pittsburgh
National Tube Co., Pittsburgh
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., Pittsburgh

SHAFTS, Flexible
Dumore Co., Racine, Wis.
Errington Mech. Lab., Stapleton, N. Y.
Haskins Co., R. G., Chicago
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Binghamton, N. Y.
Strand Co., N. A., Chicago
Walker-Turner Co., Inc., Plainfield, N. J.

SHAPERS
American Tool Works Co., Cincinnati
Ames Co., B. C., Waltham, Mass.
Atkins & Co., E. C., Indianapolis
Atlas Press Co., Kalamazoo, Mich.
Automotive Maintenance Machinery Co., N. Chicago, Ill.
Bryant Machinery & Engrg. Co., Chicago
Cincinnati Shaper Co., Cincinnati
Hanson-Whitney Mach. Co., Hartford, Conn.
Hendey Machine Co., Torrington, Conn.
Machinery Mfg. Co., Los Angeles
Morey Machinery Co., Inc., N. Y. C.
Ohio Machine Tool Co., Kenton, O.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
Rockford Mach. Tool Co., Rockford, Ill.
Smith & Mills Co., Cincinnati

SHARPENERS, Saw
Detroit Tap & Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Fellows Gear Shaper Co., Springfield, Vt.
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
Weldon Tool Co., Cleveland

SHAVING MACHINES
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Gear & Machine Co., Detroit
Michigan Tool Co., Detroit

SHEARS, Hand
Black & Decker Mfg. Co., Towson, Md.
Buffalo Forge Co., Buffalo, N. Y.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

SHEARS, Rotary
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago
Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEARS, Squaring
Beatty Mach. & Mfg. Co., Hammond, Ind.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Cleveland Crane & Engrg. Co., Wickliffe, O.
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Kent-Owens Machine Co., Toledo, O.
Mitts & Merrill, Saginaw, Mich.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEAVES, "V" Belt
Allis-Chalmers Mfg. Co., Milwaukee
American Pulley Co., Philadelphia
Dayton Rubber Mfg. Co., Dayton, O.
Earle Gear & Machine Co., Philadelphia
Gates Rubber Co., Denver, Colo.
Hill Acme Co., Cleveland

SHEET-METAL WORKING MACHINERY (See **BRAKES, Bending Press; DIES, Sheet-Metal; FORMING Machines; NIBBLERS; PRESSES; REELS, Stripstock; RIVETERS; ROLLS, Bending; SHEARS; STITCHERS, Metal**)

SHELL-MAKING Machinery
Bullard Co., Bridgeport, Conn.
Hepburn American Co., Greenwich, Conn.
Morey Machinery Co., Inc., N. Y. C.

SKIDS (See **TRUCKS, Hand**)

SLEEVES & SOCKETS, Drill
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

SLOTTERS
Baker Bros., Inc., Toledo, O.
Consolidated Machine Tool Corp., Rochester, N. Y.
Douglas Machinery Co., Inc., N. Y. C.
General Machinery Corp., Hamilton, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

SOCKETS, Drill (See **SLEEVES & SOCKETS, Drill**)

SOLVENTS, Oil & Grease
Detroit Rex Products Co., Detroit
Oakite Products, Inc., N. Y. C.

SPINDLES, Machine
Bryant Chucking Grinder Co., Springfield, Vt.
Dumore Co., Racine, Wis.
Ex-Cell-O Corp., Detroit
Heald Machine Co., Worcester, Mass.
Monarch Machine Tool Co., Sidney, O.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago

SPRINGS, Die
Allen Mfg. Co., Hartford, Conn.
Danly Machine Specialties, Chicago

SPROCKETS (See **GEARS, Cut**)

SQUARES, Precision (See **BLOCKS, Precision Gage**)

STAMPINGS, Metal
Acromark Corp., Elizabeth, N. J.
American Brass Co., Waterbury, Conn.
Continental Machines, Inc., Minneapolis
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Standard Pressed Steel Co., Jenkintown, Pa.
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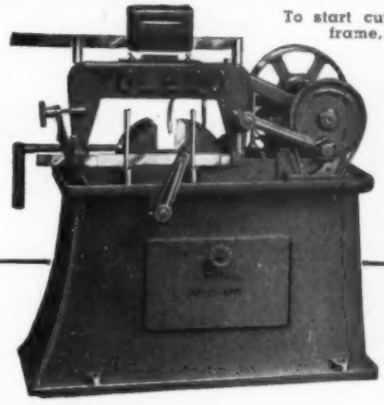

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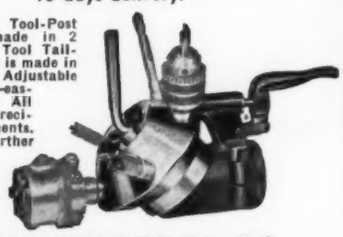

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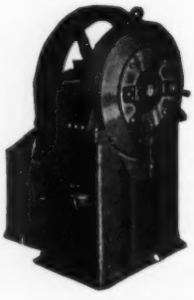

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Moore Mfg. Co., Wm., Chicago
Noble & Westbrook Mfg. Co., East Hartford, Conn.

STAMPS, Steel (See **DIES, Marking & Embossing**)

STARTERS, Motor (See **CONTROLLERS, Motor**)

STEEL, Die
Allegheny Ludlum Steel Corp., Pittsburgh
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube, Div., Canton, O.
Vanadium Alloys Steel Co., Pittsburgh

STEEL-MILL PRODUCTS
Allegheny-Ludlum Steel Corp., Pittsburgh (Steel and stainless steel sheets, plates, tubes, wire and strip)
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Bethlehem Steel Co., Bethlehem, Pa.
Bissett Steel Co., Cleveland (Tubing)
Boker & Co., Inc., H., N. Y. C.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Jones & Laughlin Steel Corp., Pittsburgh
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
Union Drawn Steel Co., Massillon, O. (Cold-finished)
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh

STEEL, Stainless (See preceding classification)

STEEL, Tool
Allegheny-Ludlum Steel Corp., Pittsburgh
Armstrong Bros. Tool Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Climax Molybdenum Co., N. Y. C.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
United States Steel Corp., Pittsburgh
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy Co., Inc., Cambridge, Mass.

STERILIZERS, Oil
Barrett Co., Leon J., Worcester, Mass.
Dolge Co., C. B., Westport, Conn.

STOCKS, Dies & Cutters, Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Co., Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Tool Co., Cleveland

STONES, Sharpening
Bay State Abrasive Products Co., Westboro, Mass.
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Midwest Abrasive Co., Detroit

STRAIGHTEDGES (See **DIE-MAKERS' SUPPLIES**)

STRAIGHTENERS, Wire
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

STRAIGHTENING & SIZING MACHINES
Taylor Wilson Mfg. Co., McKees Rocks, Pa.

SUB-PRESSES & DIES (See **Dies, Subpress**)

SUPERFINISHING EQUIPMENT
Ultra-Lap Mach. Co., Detroit

SURFACE-BROACHING MACHINES (See **BROACHING MACHINES**)

SURFACE PLATES (See **PLATES, Surface**)

SWAGING MACHINES
Etna Machine Co., Toledo
Hardinge Brothers, Inc., Elmira, N. Y.
Torrington Co., Torrington, Conn.

SWITCHES, Electric
Adam Electric Co., Frank, St. Louis
Allen-Bradley Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Brown Instrument Co., Philadelphia
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
L-W Chuck Co., Toledo, O.
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SWITCHES, Limit
Adam Electric Co., Frank, St. Louis
Allen-Bradley Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
National Acme Co., Cleveland
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SYSTEMS, Production & Tool Control
McCaskey Register Co., Alliance, O.

TABLES, Elevating Portable
Hamilton Tool Co., Hamilton, O.

TACHOMETERS (See **INDICATORS, Speed**)

TANKS & CYLINDERS, Air
Clearing Machine Corp., Chicago
Curtis Pneu. Machinery Co., St. Louis
National Tube Co., Pittsburgh
Tomkins-Johnson Co., Jackson, Mich.

TAPER PINS (See **PINS, Dowel & Taper**)

TAPES, Measuring
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

TAPPERS, Single & Multi-Spindle
Armstrong-Blum Mfg. Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Baker Bros., Inc., Toledo, O.
Barber-Colman Co., Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F. & John, Rockford, Ill.
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Buffalo Forge Co., Buffalo, N. Y.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati-Gilbert Machine Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
Etteo Tool Co., Brooklyn, N. Y.
Foote-Burt Co., Cleveland
Geometric Tool Co., New Haven, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Haskins Co., R. G. Chicago
Hill Acme Co., Cleveland
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ind.
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
National Auto. Tool Co., Richmond, Ind.
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Snyder Tool & Engrg. Co., Detroit

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Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
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Excello Corp., Detroit
Geometric Tool Co., New Haven, Conn.
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Lees-Bradner Co., Cleveland
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Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mach. Wks., Waltham, Mass.
Warner & Swasey Co., Cleveland

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Hill Acme Co., Cleveland
V. & O. Press Co., Hudson, N. Y.

THERMOMETERS, Dial
Brown Instrument Co., Philadelphia
Strong, Carlisle & Hammond Co., Cleveland

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Detroit Tap & Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Williams & Co., J. H., N. Y. C.

TOOLS, Boring
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Bullard Co., Bridgeport, Conn.
Carboloy Co., Detroit, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
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Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Heald Machine Co., Worcester, Mass.
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Lucas Machine Tool Co., Cleveland
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
National Tool Co., Cleveland
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Sturdimatic Tool Co., Detroit
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Kent-Owens Machine Co., Toledo, O.
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Smit & Son, J. K., N. Y. C.

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Haskins Co., R. G., Chicago
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Stow Mfg. Co., Binghamton, N. Y.
Strand & Co., N. A., Chicago
Walker-Turner, Inc., Plainfield, N. J.

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Armstrong Bros. Tool Co., Chicago
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Black & Decker Mfg. Co., Towson, Md.
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Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
Rotor Tool Co., Cleveland
Schauer Machine Co., Cincinnati
Skilsaw, Inc., Chicago
Walker-Turner Co., Plainfield, N. J.

TOOLS, Portable Pneumatic
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Onsrud Machine Works, Inc., Chicago
Rotor Tool Co., Cleveland
Sheldon Machine Co., Chicago

TOOLS, Stellite
Haynes Stellite Co., N. Y. C.

TORCHES, Gas-Cutting & Welding
Air Reduction, N. Y. C.

TRANSMISSIONS, Hydraulic
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Elmes Engrg. Wks., Chas. F., Chicago
Ex-Cell-O Corp., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.

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Kingsbury Mach. Tool Corp., Keene, N. H.

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USED MACHINERY (See Searchlight Section)

V BLOCKS (See Blocks, V)

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Johnson Tool Co., E. Providence, R. I.
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L-W Chuck Co., Toledo, O.
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Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
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Jones & Laughlin Steel Corp., Pittsburgh
Page Steel & Wire Div. Amer. Chain & Cable Co., Inc., Monessen, Pa.
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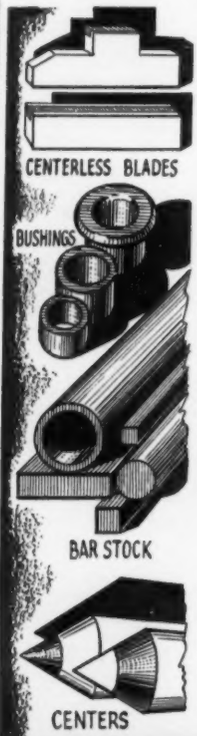

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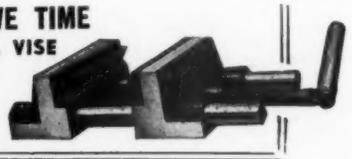

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ADVERTISERS INDEX

	Page
Abrasive Machine Tool Co.	131
Acromark Corp.	176
Adam Electric Co., Frank	126
Adams Company	102
Advance Machine Works	167
Allegheny Ludlum Steel Corp. (Ed.)	798
Allen Manufacturing Co.	118
Allis-Chalmers Mfg. Co.	55
American Chain & Cable Co., Inc.	118
American Industries Salvage Committee	52b, 52c
American Magnesium Corp.	79
American Optical Co.	121
American Pulley Co.	107a, 107b
American Screw Co.	74
American Tool Works Co.	16
Armstrong-Blum Mfg. Co.	52
Armstrong Bros. Tool Co.	49
Arter Grinding Machine Co.	124
Atlantic Machinery Corp.	173
Atometric Precision Gage Laboratories, Inc.	163
Auto-Ordnance Corp.	53
Avey Drilling Machine Co., Inc.	168
Baldwin Southwark Div. Baldwin Locomotive Works (Ed.)	805
Bantam Bearings Corp.	100
Barber-Colman Co.	26
Barnes Co., W. F. & John	86
Barnes Drill Co.	169
Barrett Co., Leon J.	108
Baumbach Mfg. Co., E. A.	168
Bilgram Gear & Machine Works	105
Blanchard Machine Co.	60
Blount Co., J. G.	92
Bodine Corp.	135
Boker & Co., Inc., H.	185
Boyar Schultz Corp.	174
Braum Gear Co.	104
Bridgeport Safety Emery Wheel Co.	167
Bristol Co.	74
Brown & Sharpe Mfg. Co.	89
Bryant Chucking Grinder Co.	18, 19
Bullard Company	63
Burke Machine Tool Co.	178
Butterfield & Co. (Div. of Union Twist Drill)	46
Campbell, Andrew C., Div. American Chain & Cable Co., Inc.	147
Carbide Fabricators Div. Morse Tool Co.	80
Carboloy Co., Inc. (Ed.)	801
Card Mfg. Co., S. W. (Div. of Union Twist Drill)	47
Carlton Machine Tool Co.	169
Central Screw Co.	74
Chandler Products Corp.	74
Chicago Wheel & Mfg. Co.	71
Cincinnati Bickford Tool Co.	67
Cincinnati Bickford Tool Co.	104
Cincinnati Grinders Incorporated	10, 11
Cincinnati Gear Co.	104
Cincinnati Lathe & Tool Co.	177
Cincinnati Milling Machine Co.	4, 5
Cincinnati Planer Co.	70
Clearing Machine Corp.	41
Cleveland Crane & Engineering Co.	141
Cleveland Punch Shear Works Co.	38
Cone Automatic Machine Co., Inc.	33
Consolidated Machines Tool Corp.	23
Continental Machine, Inc.	27
Continental Screw Co.	74
Copperweld Steel Co.	76
Corben Screw Corp.	74
Coulter Machine Co., James	116
Covel Mfg. Co.	44
Crafts & Co., Inc., Arthur A.	167
Criterion Machine Works	174
Cross Gear & Machine Co.	101
Cunningham Co., M. B.	183
Cushman Chuck Co.	123
Danly Machine Specialties, Inc.	183
Davis & Thompson Co.	133
Davis Keyseater Co.	175
Desmond-Stephan Mfg. Co.	169
Detroit Rex Products Co.	119
Detroit Tap & Tool Co. (Ed.)	809
Detroit Universal Duplicator Co.	59
Dodge Chicago Plant	82
Dow Chemical Co.	81
Dykem Co.	164
Earle Gear & Machine Co.	172
Eastern Machine Screw Corp.	168
East Shore Machine Products Co.	165
Electric Furnace Co.	170
Errington Mechanical Laboratory	185
Etna Machine Co.	184
Excello Corp.	48
Federal Bearings Co. Inc.	58
Fellows Gear Shaper Co.	8, 9
Fenn Mfg. Co.	62
Firth-Sterling Steel Co.	34, 35
Fitchburg Engineering Corp.	140
Fitchburg Grinding Machine Corp.	90
Fosdick Machine Tool Co.	32
Gallmeyer & Livingston Co.	173
Ganschow Gear Co.	104
Gear Specialties, Inc.	104
General Machinery Corp. (Mass.)	173
General Machinery Corp. (Ohio)	54
Geometric Tool Co.	169
Gisholt Machine Co.	40, 61
Gleason Works	3
Goss & de Leeuw Machine Co.	120
Granite State Machine Co.	179
Grant Gear Works	102
Grant Mfg. Machine Co.	180
Greenfield Tap & Die Corp.	132
Hamilton Tool Co.	184
Hammond Machinery Builders	128
Hardinge Brothers, Inc.	17
Harnischfeger Corp.	129
Hartford Special Machinery Co.	102, 134
Haskins Co., R. G.	163
Heald Machine Co.	2nd Cover
Hobart Bros. Co.	186
Holman Reamer Co.	180
Hones, Inc., Chas. A.	171
Hooven, Owens, Rentschler Co.	54
Howell Electric Motors Co.	111
Hydraulic Press Mfg. Co.	28, 29
International Screw Co.	74
Jefferson Machine Tool Co.	184
Johnson Machine Co., Carlyle	105
Johnson Tool Co., Inc.	186
Jones & Lamson Machine Co.	6, 7
Junkin Safety Appliance Co., Inc.	182
Kearney & Trecker Corp.	20, 21
Kempsmith Machine Co.	37

ADVERTISERS INDEX

(Continued from preceding page)

	Page
Kent-Owens Machine Co.	139
Kingsbury Machine Tool Co.	66
Knight Machinery Co., W. B.	176
L. W. Chuck Co.	183
Lamson & Sessions Co.	74
Landis Machine Co.	14, 15
Landis Tool Co.	42
Latrobe Electric Steel Co.	93
Leach Machinery Co., H.	172
LeBlond Machine Tool Co., R. K.	65
Lees-Bradner Co.	43
Leland-Gifford Co.	170
Lempco Products, Inc.	149
Liberty Planers, Inc.	179
Liberty Tool & Gage Works	124
Linley Brothers Co.	178
Lodge & Shipley Machine Tool Co.	30
Lovejoy Tool Co., Inc.	137
Lucas Machine Tool Co.	165
Lucas & Sons, Inc., J. L.	113
McGraw-Hill Book Co., Inc.	146
McKay Co.	106
McKenna Metals Co.	114
Machinery Mfg. Co.	138
Macklin Co.	110
Makepeace Co., D. E.	142
Matthews, & Co., James H.	182
Mattison Machine Works	112
Meisel Press Mfg. Co.	104
Metal Carbides Corp.	186
Micromatic Hone Corp.	50, 51
Mid-West Abrasive Co.	125
Mill Supplies	117
Mitts & Merrill	175
Modern Tool Works	109
Moline Tool Co.	134
Mollart Engineering Co., Ltd.	128
Monarch Machine Tool Co.	24, 25
Moore Mfg. Co., Wm.	170
Morey Machinery Co., Inc.	114, 126, 148, 162, 180
Morse Chain Co.	36
Morse Twist Drill & Machine Co.	115
Motch & Merryweather Co.	88
Murchey Machine & Tool Co.	168
National Machine Tool Co.	167
National Screw & Mfg. Co.	74
Newark Gear Cutting Machine Co.	105
New Britain-Gridley Div. New Britain Machine Co.	3rd Cover
New England Screw Co.	74
Niagara Machine & Tool Works	145
Nichols & Sons, W. H.	136
Nicholson & Co., W. H.	163
Nilson Machine Co., A. H.	142
Niles Tool Works Co.	54
Noble & Westbrook Mfg. Co.	177
Norton Co.	52-a
Oakite Products, Inc.	114
Oliver Instrument Co.	122
Onsrud Machine Works Inc.	52-d
Parker-Kalon Corp.	74, 98
Parker Co., Chas.	74
Pawtucket Screw Co.	74
Perkins Machine & Gear Co.	105
Pheoll Mfg. Co.	74
Philadelphia Gear Works	103
Phillips Screw Mfgrs.	74
Porter Cable Machine Co.	126
Porter-McLeod Mach. Tool Co. Inc.	148
Portman Machine Tool Co.	172
Potter & Johnston Machine Co.	39
Pratt & Whitney Div. Niles Bement Pond Co.	31
Production Machine Co.	172
Producto Machine Co.	168
Racine Tool & Machine Co.	182
Randall & Stickney	171
Ready Tool Co.	168
Reed-Prentice Corp.	175
Reliance Elec. & Engineering Co.	96
Republic Steel Corp.	84, 85
Revere Copper & Brass, Inc. (Ed.)	811
Roberts Rubber Co., Weldon	87
Russell, Burdsall & Ward Bolt & Nut Co.	74
Ruthman Machinery Co.	181
Ryerson Sons, Inc., Jos. T. (Ed.)	813
Schauer Machine Co.	177
Scherr Co., Inc., George	116
Schultz & Anderson Co.	148, 181
Scovill Mfg. Co.	74
Scully Steel Products Co.	91
Sebastian Lathe Co.	176
Sellers & Co., Inc., Wm.	77
Shakeproof Inc.	74
Shell Oil Co., Inc.	78
Shore Instrument & Mfg. Co., Inc.	174
Simmons Machine Tool Corp.	56, 136
Sisalkraft Co.	107
Skilsaw, Inc.	64
Smith & Mills Co.	182
Socony-Vacuum Oil Co.	72, 73
Sommer & Adams Co.	178
South Bend Lathe Works	57
Southington Hardware Mfg. Co.	74
Springfield Machine Tool Co.	176
Square D Co.	99
Standard Pressed Steel Co.	150, 165
Steelweld Machinery Div. Cleveland Crane & Engineering Co.	141
Sterling Grinding Wheel Div.	127
Strand Co., N. A.	170
Stuart Oil Co., D. A. (Ed.)	814
Sturdimatic Tool Co.	165
Sundstrand Machine Tool Co.	95
Sun Oil Co. (Ed.)	803
Thompson & Son Co. Henry G.	147
Timken Roller Bearing Co.	4th Cover
Steel & Tubes Div.	94
Torrington Co. (Ed.)	807, 184
Tool Engineering Service Co., Inc.	179
Trundle Engineering Co. (Ed.)	812
Ultra-Lap Machine Co.	175
Union Drawn Steel Co.	84, 85
Union Twist Drill Co.	45
U. S. Steel Corp.	91
Universal Boring Machine Co.	164
Universal Engineering Co.	162
V. & O. Press Co., Inc.	181
Vanadium-Alloys Steel Co.	75
Van Norman Machine Tool Co.	12, 13
Vard Inc.	83
Vascoloy-Ramet Corp.	97
Victor Saw Works, Inc.	144
Vonnagut Moulder Corp.	164
Walker-Turner Co.	130
Walker Co., Inc., O. S.	108
Waltham Machine Works	104
Warner & Swasey Co.	68
Watson-Stillman Co.	143
Webber Gage Co.	(Ed.) 796
Westinghouse Elec. & Mfg. Co.	22, 102
Whitney Screw Corp.	74
Wiedemann Machine Co.	144
Wigglesworth Machine Tool Co.	120
Wilson Mechanical Inst. Co., Inc.	175
Wright Mfg. Div American Chain & Cable Co., Inc.	118
Zeh & Hahnemann Co.	180

■

SEARCHLIGHT SECTION

Classified Advertising

Classification	*Page*
BUSINESS OPPORTUNITIES	153
CONTRACT WORK SECTION	151, 152
Abbott Ball Co.	152
Agerstrand Corp.	152
Bay City Forge Co.	152
Eastern Tool & Mfg. Co.	152
Fidelity Machine Co.	152
General Pattern Works	152
Gest Engineering & Equipt. Co.	151
Creist Manufacturing Co.	151
Haida Engineering Co.	151
Holmes & Bros. Inc., Robt.	152
Kirk & Blum Manufacturing Co.	151
National Brass Co.	151
Nilson Machine Co., A. H.	151
Norlipp Co.	151
Product Engineering Service	152
Reed Machine & Tool Engineers	152
Reliance Machine & Manufacturing Co.	151
Secrest Company, Lawrence W.	152
Thomas & Skinner Steel Prods. Co.	151
Vandegrift Company, C.	151
PATENT ATTORNEY	153
PATENTS FOR SALE	153
POSITIONS VACANT	153
POSITIONS WANTED	153
REBUILDING SERVICE	156-161
Reconstruction Machine Tool Corp.	156
Simmons Machine Tool Corp.	161
WANTED TO PURCHASE	160
USED SURPLUS EQUIPMENT	154-161
Aaron Machinery Co.	154-161
Acme Eq. Co.	161
Bradley Machinery Co.	158
Central Machine Tool Corp.	154
Cincinnati Machinery & Supply Co.	159
Dony Machinery Co., D. E.	160
Eastern Machinery Co.	154
Emerman & Co., Louis E.	156
Falk Machinery Co.	155
Galbreath Machinery Co.	161
Hill-Clark Machinery Co.	154-157
Howard Foundry Co.	160
Hyman & Son, Joseph	156
Indianapolis Machy. & Supply Co., Inc.,	154-156
Inland Machinery Co.	161
Interstate Machinery Co.	159
Jones Machine Tool Co.	159
Lang Machy. Co.	160
Marsh Machinery Co., A. R.	158
Miles Machinery Co.	159
Mills-Gavan Mchy. Co.	160
Morey Machinery Co., Inc.	156
Nutall, J.	161
O'Brien Machy. Co.	154
Osborne & Sixton Machinery Co.	158
Ott Machinery Sales, Inc.	158
Reconstruction Machine Tool Corp.	156
Rosenkranz Machinery Co.	154
Simmons Machine Tool Corp.	161
S & S Machinery Co.	158
Sperry Products, Inc.	160
Strong Carlisle & Hammond Co.	158
Victor Machinery Co.	161
West Penn Machinery Co.	159
Wigglesworth Machinery Co.	158
Wigglesworth Mchy. Co., T. R.	159
Zeeze & Co., Alex.	154

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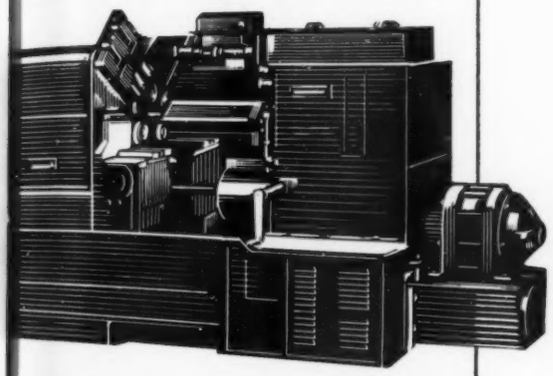

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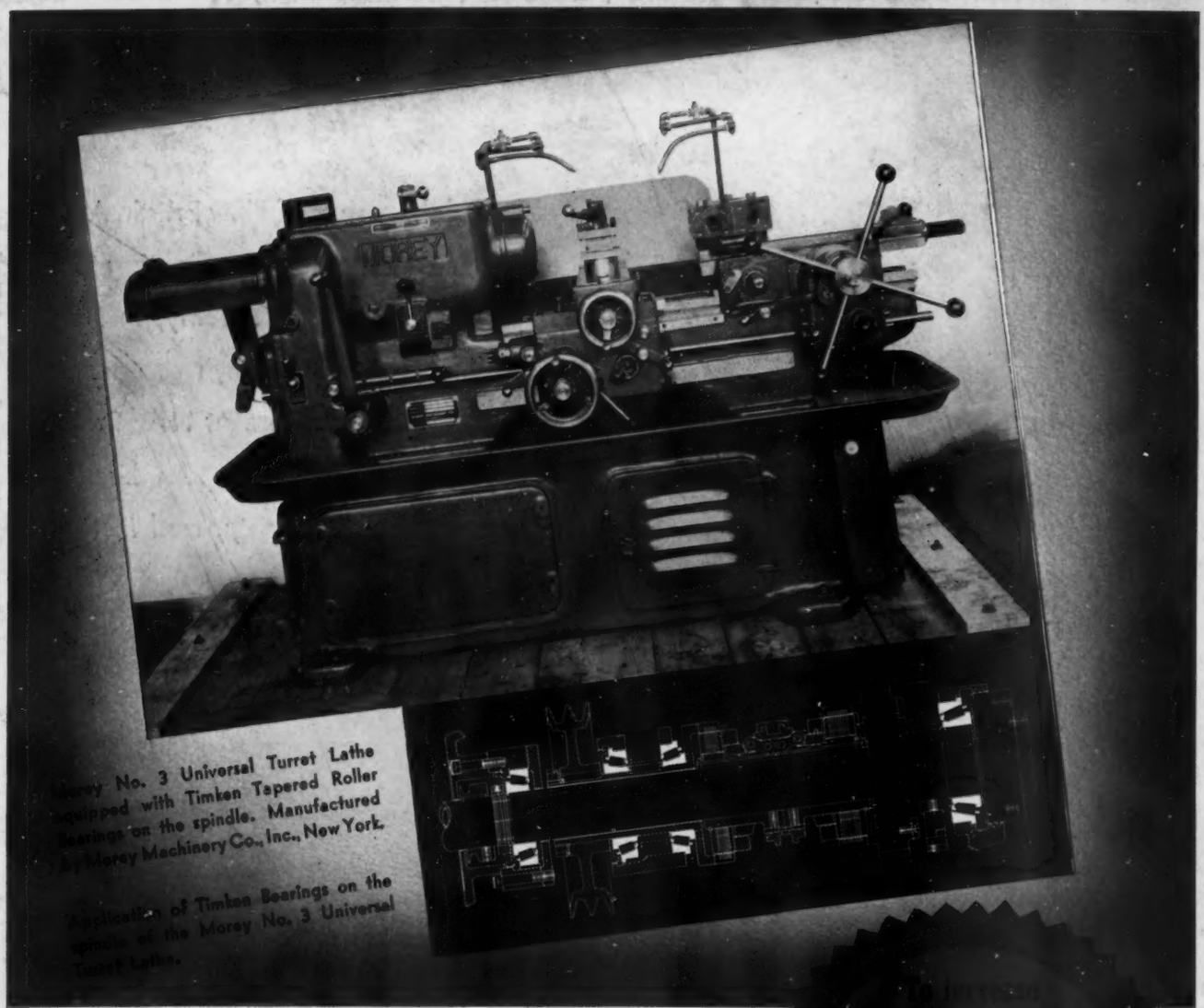

Morey No. 3 Universal Turret Lathe equipped with Timken Tapered Roller Bearings on the spindle. Manufactured by Morey Machinery Co., Inc., New York.

Application of Timken Bearings on the spindle of the Morey No. 3 Universal Turret Lathe.

No other single feature contributes so much to speed and precision in machine tools as the use of Timken Tapered Roller Bearings.

Timken Bearings eliminate friction and wear in all rotating parts; they assure maximum and sustained spindle rigidity; they give full protection against radial loads, thrust loads and any combination of both; they hold moving parts in constant alignment.

Every heavy duty machine should have Timken Bearings on the spindle for precision's sake; an overwhelming majority of them do. Many machines use them on all head stock shafts, in feed mechanisms and live tail-stock centers.

The more Timken Bearings there are in any machine the more efficiently and more economically it will operate, the less it will cost for maintenance and the longer it will last.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

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TAPERED ROLLER BEARINGS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.